

Mather Air Force Base

Five-Year Review of Remedial Actions

Conducted Under the

Comprehensive Environmental Response,  
Compensation, and Liability Act

September 24, 1999

**Air Force Base Conversion Agency**



**DEPARTMENT OF THE AIR FORCE**  
**AIR FORCE BASE CONVERSION AGENCY**

08 Feb 2000

**MEMORANDUM FOR DISTRIBUTION**

**FROM:** AFBCA/Division A Mather  
10503 Armstrong Avenue  
Mather, CA 95655

**SUBJECT:** Transmittal of Signed Five-Year Review Report for Mather AFB

1. Transmitted hereby is the subject document. The report became final on October 4, 1999, after changes were agreed to in response to concerns raised by the Regional Water Quality Control Board. The changes were incorporated in the response to comments on page B-8 and in the text on page 3-15. In addition, pagination was adjusted on pages 3-12 through 3-20, a blank filled in on page A-14, response to comment #6, and the signature page revised to reflect the Air Force signature by Albert Lowas.

2. Additional, unbound copies are available upon request to my office. Please address any questions to Bill Hughes, WPI, at (916) 364-4007.

*for*   
ANTHONY C. WONG  
BRAC Environmental Coordinator

**Attachment:** Signed Mather Five-Year Review Report

**DISTRIBUTION:**

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U.S. EPA Region IX, Attn: Debbie Lowe (SFD-8-3)  
DTSC, Attn: Carolyn Tatoian-Cain  
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## List of Acronyms

AAFES	Army Air Force Exchange Service
AC&W	Aircraft Control and Warning
AFB	Air Force Base
AFBCA	Air Force Base Conversion Agency
AGE	Aerospace Ground Equipment
ARAR	Applicable or Relevant and Appropriate Requirement
ASC	Additional Site Characterization
ATC	Air Training Command
AVGAS	Aviation Gasoline
BACT	Best Available Control Technology
BCRA	Base Closure and Realignment Act
BE	Bioenvironmental
bls	below land surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CCR	California Code of Regulations
CE	Civil Engineering
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CVRWQCB	Central Valley Regional Water Quality Control Board
DCA	Dichloroethane
DCB	Dichlorobenzene
DCP	Dichloropropane
DCE	Dichloroethene
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DTSC	Department of Toxic Substances Control
EA	EA Engineering, Science, and Technology
ESD	Explanation of Significant Difference
FAA	Federal Aviation Administration
FFA	Federal Facility Agreement
FFS	Focused Feasibility Study
FR	Federal Register
FR	Firing Range (IRP site designation)
FT	Fire Training (IRP site designation)
gpm	gallons per minute
ID	Identification
ILS	Instrumented Landing System
IRP	Installation Restoration Program
IT	International Technology
IWMB	Integrated Waste Management Board

**List of Acronyms (Continued)**

JP-4	Jet Propellant fuel
LF	Landfill (IRP site designation)
LTO&M	Long-Term Operations and Maintenance
MAFB	Mather Air Force Base
MBRA	Mather Baseline Risk Assessment
MCL	Maximum Contaminant Level
N/A	Not Applicable
NCP	National Contingency Plan
ND	Non-Detect
NFA	No Further Action
NPL	National Priorities List
O&M	Operation and Maintenance
OPS	Operating Properly and Successfully
OSWER	Office of Solid Waste and Emergency Response
OT	Other (IRP site designation)
OU	Operable Unit
ows	Oil/Water Separator
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	Perchloroethene (Tetrachloroethene)
PNA	Polynuclear Aromatic
POL	Petroleum, Oil, and Lubricant
POTW	Publicly Owned Treatment Works
ppb	parts per billion
ppm	parts per million
ppt	parts per trillion
RA	Remedial Action
RAB	Restoration Advisory Board
RAM	Removal Action Memorandum
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
RW	Radioactive Waste (IRP site designation)
RWQCB	Regional Water Quality Control Board
SAC	Strategic Air Command
SARA	Superfund Amendments and Reauthorization Act of 1986
SCEMD	Sacramento County Environmental Management Department
SD	Storm Drain (IRP site designation)
SS	Sanitary Sewer (IRP site designation)
ST	Storage Tank (IRP site designation)
SVE	Soil Vapor Extraction
TBD	To Be Determined
TCA	Trichloroethane
TCDD	Tetrachlorodibenzo-p-dioxin



**List of Acronyms (Continued)**

TCE	Trichloroethene
TPH	Total petroleum hydrocarbons
TPH-d	Total petroleum hydrocarbons reported as diesel
TPH-g	Total petroleum hydrocarbons reported as gasoline
ug/l	Micrograms per Liter
USAF	United States Air Force
U.S. EPA	United States Environmental Protection Agency
USC	United States Code
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WP	Waste Pit (IRP site designation)
WPI	Waste Policy Institute
yd <sup>3</sup>	Cubic Yards

## **1.0 INTRODUCTION**

### **1.1 Statement of Authority and Purpose**

The Air Force Base Conversion Agency (AFBCA) conducted this review pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121(c); 40 CFR 300.400(f)(4)(ii); Executive Order 12580; and OSWER Directives 9355.7-02 (U.S. EPA, 1991), 9355.7-02A (U.S. EPA, 1994), and 9355.7-03A (U.S. EPA, 1995). This report incorporates statutory five-year reviews on two landfill sites and one groundwater cleanup site, for which remedies are in place but at which contamination remains, and streamlined policy reviews at 14 other sites and two other groundwater plumes where remedial action is in progress and may take more than five years to complete, on Mather Air Force Base (AFB), near Sacramento, California. The purpose of a five-year review is to ensure that remedial actions remain protective of public health and the environment and are functioning as designed. This report will become a part of the Administrative Record for each site for which a five-year review is herein documented.

This five-year review report summarizes the status of actions taken pursuant to Records of Decision (RODs) for five operable units (OUs) at Mather Air Force Base (AFB), Sacramento County, California. This five-year review is required under the Comprehensive Environmental Response, Cleanup, and Liability Act (CERCLA). The purpose of the review is to determine if remedial response actions are protective of human health and the environment, and to make recommendations to attain or maintain protectiveness. This review was conducted by the Air Force Base Conversion Agency under Executive Order 12580, which delegates review responsibility to federal facilities at which the sole source of the release is under the control of the facility.

### **1.2 Statutory Requirements and Guidance for Five-Year Reviews**

The statutory requirement for five-year reviews is found as part of the Comprehensive Environmental Response, Compensation, and Liability Act, and is found at *42 USC Section 9621 (c) (January 16, 1996)*:

#### *Review*

*If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section 9604 or 9606 of this title, the President shall take or require such action. The*

*President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

This requirement is also included in U.S. EPA regulations found at 40 CFR 300.430(f)(4)(ii) (as of July 1, 1997):

*If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.*

### 1.2.1 Statutory Reviews

U.S. Environmental Protection Agency guidance found in OSWER Directive 9355.7-02A (U.S. EPA, 1994) dictates that U.S. EPA or other responsible federal agency should complete a statutory review within five years of the initiation of the first remedial action at a site. The Air Force, as lead agency responsible for conducting the environmental remediation at Mather AFB, has conducted this review. Concurrence by U.S. EPA and the State of California is indicated by signature in Section 7.0. The timing of Mather's review was dictated by the start of construction on the remedial action for the Aircraft Control and Warning (AC&W) Site, the sole site requiring remedial action in the AC&W Operable Unit, on June 29, 1994. The completion date for this review was therefore June 29, 1999. Upon issuance of the review report on June 29, 1999, the remedial project managers (RPMs) from the State of California requested an additional review cycle. This was agreed to by the RPMs from the Air Force Base Conversion Agency and the U.S. EPA. Therefore this revision was prepared to address additional comments found in Appendix B. In accordance with Section 27.3 of the Federal, Facilities Agreement for Mather Air Force Base, and consistent with OSWER Directive 9355.7-02A (U.S. EPA, 1994), this review covers all operable units at Mather AFB.

The Federal Facility Agreement (FFA) for Mather Air Force Base, also called the Interagency Agreement, was signed in July 1989 by the Air Force, U.S. EPA, and the State of California. The FFA contains the following in Section 27:

#### 27. FIVE YEAR REVIEW

*27.1 Consistent with 42 U.S.C. Section 9621(c) and in accordance with this Agreement, if the selected remedial action results in any hazardous substances, pollutants or contaminants remaining at the Site, the Parties shall review the remedial action program at least every five years after the initiation of the final remedial action to assure that human health and the environment are being protected by the remedial action being implemented*

*27.2 If upon such review, any of the Parties proposes additional work or modification of work such proposal shall be handled under Subsection 7.1.0 of this Agreement.*

*27.3 To synchronize the five-year reviews for all operable units and final remedial actions, the following procedure shall be used. Review of operable units will be conducted every five years counting from the initiation of the first operable unit, until initiation of the final remedial action for the Site. At that time a separate review for all operable units shall be conducted. Review of the final remedial action (including all operable units) shall be conducted every five years, thereafter.*

### 1.2.2 Policy Reviews

U.S. EPA distinguishes between statutory five-year reviews, and policy reviews. Statutory five-year reviews are required by statute for all sites for which a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure. Policy reviews are defined in OSWER Directive 9355.7-02 (U.S. EPA, 1991), in which U.S. EPA commits to conducting policy reviews at sites which upon completion of remedial action will allow unlimited use and unrestricted exposure, but which will require at least five years to attain the cleanup levels specified in the ROD. This review identifies the sites at Mather that fit EPA's definitions for statutory or policy reviews.

Within U.S. EPA guidance in OSWER Directive 9355.7-02A (U.S. EPA, 1994), U.S. EPA defines a streamlined (Type Ia) review appropriate at sites where remedial action is ongoing and a more in-depth review is not indicated. Once all operable unit remedial actions are constructed and there is less active presence at the site, a more rigorous Type I review is appropriate. The Type Ia review at an active site omits the site visit and the review of Applicable or Relevant and Appropriate Requirements (ARARs) that are included in a Type I review.

## 1.3 Scope and Nature of Current Five-Year Review

This five-year review consists of Type IA policy reviews for most sites undergoing remedial action, and Type I statutory reviews for Sites 3, 4, and the Northeast Plume, all of which have remedial actions in the long-term monitoring stage. Site 87, a skeet/trap range in the Basewide Operable Unit (OU), is undergoing remediation that is expected to result in lead remaining in soil at the site above a concentration that allows for unlimited use and unrestricted exposure. Therefore, Site 87 will require a Type I statutory review during the next five-year review at Mather. Site 89 is a trap range in the Supplemental Basewide OU, for which a feasibility study is currently in preparation. It, like Site 87, may be remediated such that lead remains in soil at the site above a concentration that allows for unlimited use and unrestricted exposure. If so, Site 89 will also require a Type I statutory review during the next five-year review at Mather.

A summary list of Mather's Installation Restoration Program (IRP) sites, their remediation status, and the type of five-year review (if any) they received is presented in Table 1.

This five-year review was conducted by evaluating the status and performance of remedial actions taken to date, and determining if those actions meet or demonstrate

progress consistent with meeting the specific goals and objectives stated in the ROD requiring the remedial action. For the landfill sites where the landfill cap and institutional controls provide the protectiveness, the review focuses on the integrity of the cap and the controls. For sites undergoing groundwater or in situ treatment, the review addresses whether the technologies chosen in the remedial action are still appropriate.

**TABLE 1: IRP Five-Year Review Status**

Site ID	Site Description	OU	Type of Review Statutory Policy		Notes
LF-01	Runway Overrun Landfill	4			No Further Action (NFA)
LF-02	“8150” Area Landfill	4			Groundwater Monitoring (proposed to terminate)
LF-03	Northeast Perimeter Landfill No. 1	4	I		Cap in place; in LTO&M
LF-04	N.E. Perimeter Landfill No. 2	4	I		Cap in place; in LTO&M
LF-05	N.E. Perimeter Landfill No. 3	4			Groundwater Monitoring
LF-06	Firing Range Area Landfill Sites	4			Groundwater Monitoring
WP-07	“7100” Area Disposal Site	3		Ia	In situ treatment Cap in 1999 or 2000
FT-08	Former Fire Training Area 1	5			NFA
FT-09	Former Fire Training Area 2 (used 1945 to 1947)	3			NFA
FT-10	Former Fire Training Area 3 (Used 1947 to 1958)	3			NFA
FT-10C	Fire Training Area 3 (Revised location)	5		Ia	In situ treatment
FT-11	Existing Fire Training Area (Used 1958 to 1993)	3		Ia	In situ treatment
WP-12	Aircraft Control and Warning Site	1		Ia	OPS concurrence November 1998
SD-13	Drainage Ditch No. 1 (east of Facility 2950)	3			Excavation of ditch sediment and surface soils; Closure Report Final

<b>TABLE 1 (continued): IRP Five-Year Review Status</b>					
Site ID	Site Description	OU	Type of Review Statutory Policy		Notes
SD-14	Drainage Ditch No. 2 (northeast of Facility 3975)	3			NFA
SD-15	Drainage (West) Ditch No. 3, incl. OWS Facility 7039	3			Excavation of ditch sediment; Closure Report in review
RW-16	Electron Tube Burial Site under Facility 8170	3			NFA
WP-17	Weapons Storage Area Septic Tank (south of Facility 18080)	5			NFA
LF-18	Old Burial Site (north of Facility 4120)	5		Ia	In Situ Treatment
WP-19	Fuel Tank 4015 & Sludge Burial Site (near Facility 4012)	3*			*selected for no further action under CERCLA but remains to be closed under other regulations
ST-20	Sewage Treatment Plant UST and Sludge Drying beds	3/5			CERCLA closure pending. UST closure letters from SCEMD 6/17/87 & 6/15/98. RWQCB concurrence letter 5/15/98.
OT-21	Asphalt Rubble Storage Site (northeast of Facility 7125)	3			NFA
OT-22	Asphalt Rubble Storage Site (adjacent to Nav Rd.)	3			NFA
OT-23	Main Base Sanitary Sewer System	5		Ia	In Situ Treatment
ST-24	JP-4 Spill Site at SAC Aircraft Parking Apron	3			NFA
ST-25	Former UST for Emergency Generator, Facility 10100	1			NFA

<b>TABLE 1 (continued): IRP Five-Year Review Status</b>					
Site ID	Site Description	OU	Type of Review Statutory Policy		Notes
ST-26	Former UST for ILS Localizer Emergency Generator, Facility 10072	3			NFA
ST-27	Former UST for Communications Transmitter Emergency Generator, Facility 10060	3			NFA
ST-28	Former UST for Water Supply Emergency Generator, Facility 16100	3			NFA
ST-29	4 Former UST at Military Gas Station, Facility 3167	3*			*selected for no further action under CERCLA but remains to be closed under other regulations
ST-30	Former UST Security Police Emergency Generator, Facility 10300	1			NFA
ST-31	Former UST Transmitter Emergency Generator, Facility 10090	3			NFA
ST-32	6 Former UST at AAFES Service Station, Facility 2410	3*			*selected for no further action under CERCLA. Closed by RWQCB letter 4/15/97.
ST-33	6 Former UST at CE Paint Shop, Facility 3308	3			NFA
ST-34	5 Former UST at AAFES Service Station, Facility 21030	3*			*selected for no further action under CERCLA but remains to be closed under other regulations
ST-35	4 Former UST at POL Yard 1, Facility 3226	3*			*selected for no further action under CERCLA but remains to be closed under other regulations

<b>TABLE 1 (continued): IRP Five-Year Review Status</b>					
Site ID	Site Description	OU	Type of Review Statutory Policy		Notes
ST-36	4 Former UST at Old Rail Yard 2, Facility 3286	3*			*selected for no further action under CERCLA but remains to be closed under other regulations
ST-37	5 Former UST at BE Storage Yard, Facility 3389	3		Ia	In Situ Treatment
ST-38	2 Former UST at BE Storage Yard, Facility 3388	3			NFA
ST-39	8 Former UST at Hazardous Waste Storage Facility 4305	3		Ia	In Situ Treatment
ST-40	Former UST for Training Classroom Boiler, Facility 3875	3			Closed by SCEMD letter 1/22/91.
ST-41	2 Former UST at Old Motor Pool, Facility 2995	3			Closed by SCEMD letter 1/22/91.
ST-42	Former UST at Old Motor Pool, Facility 2898	3			Closed by SCEMD letter 1/22/91.
ST-43	2 Former UST Water Supply Emergency Generator, Facility 10150	3			Closed by SCEMD letters 1/22/91 & 10/8/96.
SD-44	Former OWS at old Weapons Storage Area, Facility 8540	3			Closed by SCEMD letter 1/22/91.
ST-45	Former Ammonia UST for Missile Facility, Facility 7003	3			Closed by SCEMD letter 1/22/91.
ST-46	Former UST for Alert Crew Emergency Generator, Facility 8158	3			Clean closure letters from SCEMD 6/27/96 & 6/28/96.
ST-47	Former UST near Security Police Facility 10400B	1			SCEMD closure letter 10/8/96.



<b>TABLE 1 (continued): IRP Five-Year Review Status</b>					
Site ID	Site Description	OU	Type of Review Statutory Policy		Notes
ST-48	Former UST for Security Police Facility 10410	3			NFA
ST-49	Former UST for Security Police Facility 10450	3			NFA
ST-50	Same as ST-34	n/a			
ST-51	Former UST for ILS Glide Slope Emergency Generator Facility 10030	3			NFA; Clean closure letters from SCEMD 6/27/96 & 6/28/96.
ST-52	Former UST for Security Police Emergency Generator Facility 10400A	3			NFA; Clean closure letters from SCEMD 6/27/96 & 6/28/96.
ST-53	Former UST for Weapons Storage Area Boiler, Facility 18051	3			NFA; Clean closure letters from SCEMD 6/27/96 & 6/28/96.
SS-54	Hazardous Waste Accumulation Point at AGE Shop, Facility 4348	3		Ia	In Situ Treatment
SD-55	OWS at Facility 7038	3			NFA
SD-56	OWS at former Motor Pool Wash Rack, Facility 2989	3		Ia	Excavation, then In Situ Treatment
SD-57	OWS at Facility 7019	3		Ia	In Situ Treatment
SD-58	OWS at Army Helicopter Wash Rack, Facility 4771	3			NFA
SD-59	OWS at ATC Wash Rack, Facility 4251	3		Ia	Excavation, then In Situ Treatment
SD-60	OWS at Facility 6900 (north side of Facility 7005)	3		Ia	Excavation, then In Situ Treatment
SD-61	OWS at Facility 6905 (south side of Facility 7005)	3			NFA

<b>TABLE 1 (continued): IRP Five-Year Review Status</b>					
Site ID	Site Description	OU	Type of Review Statutory Policy		Notes
OT-62	OWS at Facility 7110 (Jet Engine Test Stand Facility 7099)	3			Excavation of Surface and shallow subsurface soil; Closure report final
SD-63	OWS & 2 UST at former Auto Hobby Shop, Facility 3320	3			NFA; USTs received SCEMD closure letter 10/8/96.
SD-64	OWS at Fuel Truck Wash Rack, Facility 4120	3			NFA
SD-65	OWS at Facility 6910 (north corner of Facility 7009)	3			Excavation of surface and shallow subsurface soils; Closure Report final
SD-66	OWS at Facility 6915 (north corner of Facility 7024)	3			NFA
SD-67	Sanitary Sewer System in the SAC Area	5			NFA
ST-68	18 UST for SAC Area JP-4 Hydrant System	3		Ia	In Situ Treatment
OT-69	Ordinance Burning and Detonation Area	3			Excavation of surface soil and sediments (RA incomplete for sediments)
ST-70	Former UST at Dining Hall, Facility 1226	3			Referred to as Site A in ROD. Clean closure letter from SCEMD 8/30/94.
ST-71	5 Former UST at AVGAS Pumping Station, Facility 3271	3*			Referred to as Site B in ROD *selected for no further action under CERCLA but remains to be closed under other regulations
ST-72	Former UST at Water Plant, Facility 3975	3			Referred to as Site C in ROD. Clean closure letters from SCEMD 6/27/96 & 6/28/96
ST-73	Former UST for ILS Localizer Emergency Generator Facility 10015	3			Referred to as Site E in ROD. Clean closure letters from SCEMD 6/27/96 & 6/28/96.
ST-74	Former UST for Utility Vault Emergency Generator Facility 10065	3			Referred to as Site F in ROD. Clean closure letters from SCEMD 6/27/96 & 6/28/96.

<b>TABLE 1 (continued): IRP Five-Year Review Status</b>					
Site ID	Site Description	OU	Type of Review Statutory Policy		Notes
ST-75	Former UST at Weapons Storage Area, Facility 18018	3			Referred to as Site G in ROD. Clean closure letters from SCEMD 6/27/96 & 6/28/96.
ST-76	Former UST at Weapons Storage Area, Facility 18011 & 18020	3			Referred to as Site H in ROD. Closure letters for 18011 from SCEMD 6/27/96 & 6/28/96. 18020 being biovented.
ST-77	Former UST Army Helicopter Pad, Facility 4853	3			Referred to as Site I in ROD. Clean closure letters from SCEMD 10/8/96.
ST-78	2 UST East of Facility 2527 (2527 & 2527B)	n/a			Clean closure letters from SCEMD 6/17/87, 7/17/97 & 6/15/98. RWQCB concurrence letter for 2527B dated 5/15/98
ST-79	UST East of Facility 4540	n/a			Clean closure letters from SCEMD 6/17/87, & 6/15/98. RWQCB concurrence letter 5/15/98.
SD-80	Golf Course Maintenance Area Drainage	6			OU6 Feasibility Study in preparation; RA planned to be complete within 5 years.
ST-81	Sewage Oxidation Ponds	5			NFA
OT-82	Golf Course Maintenance Area (near Facility 8869)	5*			*selected for no further action under CERCLA but remains to be closed under other regulations
SD-83	Army Aviation Helicopter Washrack (Facility 4771)	5*			*selected for no further action under CERCLA but remains to be closed under other regulations
SD-84	Sewer Lines SAC Area to Sewage Treatment Plant	5			NFA
SD-85	South Ditch (N.E. Morrison Creek Tributary from Facility 10030 to 10085	6			Removal action 1998; OU6 Feasibility Study in preparation.

<b>TABLE 1 (continued): IRP Five-Year Review Status</b>					
Site ID	Site Description	OU	Type of Review Statutory Policy		Notes
OT-86	Military Small Arm Firing Range (Facility 12500)	5			Excavation and stabilization of soil; Closure Report in regulatory review.
OT-87	Rod and Gun Club Skeet and Trap Range (Facility 10330)	5	(Future I)	Ia	Excavation and stabilization of soil; Closure Report in regulatory review.
DD-88	Morrison Creek from Mather Lake to AC&W Area	6			OU6 Feasibility Study in preparation; RA planned to be complete within 5 years.
OT-89	Old Trap Range	6	(Future I)	Ia	OU6 Feasibility Study in preparation; RA planned to be complete within 5 years.
	Main Base/SAG Plume	2		Ia	Phased RA began in 1998
	Northeast Plume	2	I		Groundwater Monitoring
	Site 7 Plume	2		Ia	RA began in 1999

OU = Operable Unit (for other acronyms and initialisms, see pages i – iii)

Operable Unit 1 is the Aircraft Control and Warning Operable Unit

Operable Unit 2 is the Groundwater Operable Unit

Operable Unit 3 is the Soils Operable Unit

Operable Unit 4 is the Landfill Operable Unit

Operable Unit 5 is the Basewide Operable Unit

Operable Unit 5 is the Supplemental Basewide Operable Unit

## 1.4 Findings of the Five-Year Review

The results of this review indicate that the actions taken to address immediate health and environmental risks under the first five operable units at Mather Air Force Base are consistent with the remedial actions selected in the CERCLA records of decision for the sites, as modified for several sites by later Explanation of Significant Difference documents, and that the remedial actions at sites where contamination remains on site during the remedy are protective of human health and the environment.

With the noted exception of landfill gas control at Landfill Site 4, the specific goals stated in each ROD have been met or progress toward meeting the goals is on schedule. Corrective action to control landfill gas at Site 4 was implemented in 1998, and gas concentrations are being monitored. In order to address the possibility that gas concentrations will remain above the compliance levels, a contingency plan is in

preparation to identify options and select a preferred action to meet the limit of 5% methane at the site boundary.

Section 6.0 contains recommendations addressing two regulatory concerns. These concerns are the adequacy of institutional controls to mitigate potential exposure to contamination from Mather, and the identification of additional contaminants of potential concern that may be identified during soil vapor extraction monitoring. As a result of this review, the Air Force recommends to amend the Record of Decision for the Aircraft Control and Warning Operable Unit to add institutional controls to the remedial action for the AC&W groundwater plume. In addition the Air Force proposes to evaluate additional contaminants of potential concern prior to shutting off any of the soil vapor extraction systems at Mather.

## **2.0 SITE DESCRIPTIONS AND HISTORIES**

This section presents descriptions and histories of all the sites at Mather AFB for which remedial action has been selected in a Record of Decision (ROD) or for which a ROD has not yet been prepared. Each subsection includes the determination of whether a five-year review is required for each site.

For the sites that do not require a five-year review, more detail is provided in this section about the remedial action selected in the ROD for that site. For those sites requiring a statutory or policy five-year review, more detail regarding the remedial action selected for site is provided in Section 3, followed by an evaluation of the remedial objectives of the remedial action. This allows uninterrupted flow from description of the remedy to evaluation of remedial objectives for the sites undergoing the five-year review.

### **2.1 Overview of Mather AFB: Site Description and History**

Mather AFB is located in the Sacramento Valley, approximately ten miles east of downtown Sacramento, California, just south of U.S. Highway 50. The formerly active base encompassed approximately 5,845 acres at the time of closure (129 acres of easements) in an unsurveyed part of Township 8 North, Ranges 6 East and 7 East. Mather AFB was constructed in 1918 and its primary mission was as a Right training school. The base operated continuously as a training base for aviators from 1942 until 1993. The base was decommissioned under the Base Closure and Realignment Act on September 30, 1993. A wing of the Strategic Air Command was located at Mather from the late 1950's until 1989. Fulfilling these missions have involved use and generation of a wide range of toxic and hazardous chemicals and substances, including industrial solvents, aviation fuels, and a variety of oils and lubricants.

The Installation Restoration Program began in 1982 to identify locations at Mather AFB where hazardous substances or other pollutants might have been released to the environment. These previous investigations have confirmed the presence of volatile organic compounds and other hydrocarbons at several of the IRP sites. Based on this, the entire base was proposed for listing on the Superfund (CERCLA) National Priorities List (NPL) in July 1989, and was placed on the NPL on November 21, 1989. In July 1989, the USAF, the U.S. EPA, and the State of California signed a Federal Facility Agreement (USAF, 1989) under CERCLA Section 120 to ensure that environmental impacts from past and present operations are thoroughly investigated and appropriate cleanup actions are taken to protect human health, welfare, and the environment. The Federal Facility Agreement sets enforceable deadlines for documents, defines roles and responsibilities of each signatory party, and provides a vehicle for dispute resolution. The USAF is the owner of the site, the principal responsible party, and lead agency for conducting investigative and cleanup activities. There have been no CERCLA enforcement actions any of the sites at Mather, including the Groundwater OU plumes.

There are now 89 IRP sites at Mather, the locations of which are shown in Figure 1. There are also four major groundwater plume areas, shown on Figure 2. The 89 IRP sites have been categorized in six operable units (OUs), based upon similarities in type of site and/or timing of cleanup decisions. The Aircraft Control and Warning OU consists of a groundwater contamination plume as well as three sites where underground fuel storage tanks were removed. The Landfill OU consists of 6 sites where municipal waste was buried. The Soil OU is comprised of contaminated soils associated with waste disposal pits, oil/water separators (OWS), gas stations, underground storage tanks (USTs), fire training areas, and other miscellaneous sites. The Groundwater OU consists of contaminated groundwater plumes beneath and within the immediate vicinity of the base with the exception of the Aircraft Control and Warning (AC&W) OU plume. The Basewide OU and the Supplemental Basewide OU consist of the remaining sites identified at Mather.

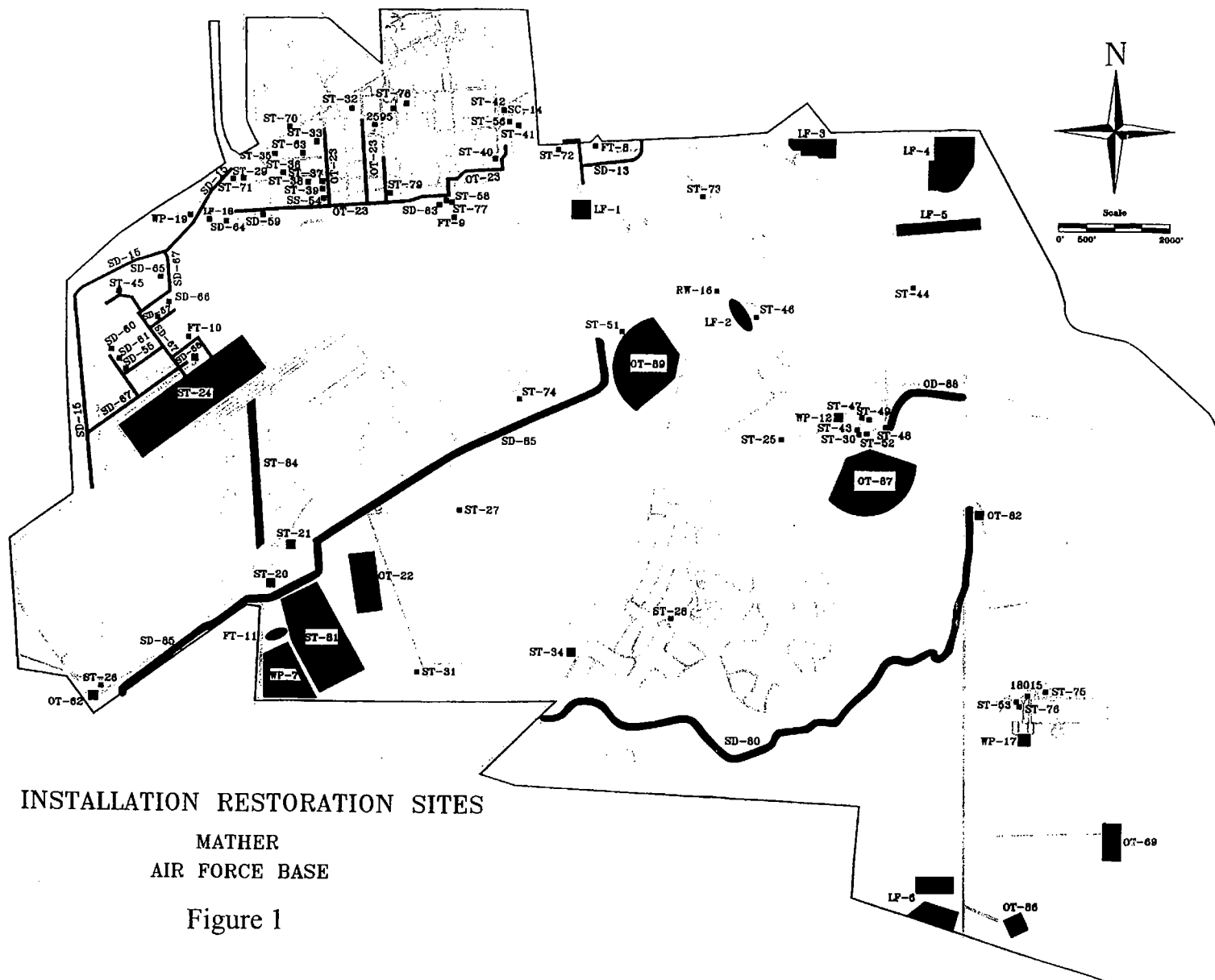
## **2.2 AC&W OU History and Contamination Summary**

The Aircraft Control and Warning (AC&W) Site is the location of a radar station now operated by the Federal Aviation Administration (FAA) but formerly operated jointly by the FAA and the Air Force. The AC&W Site is Installation Restoration Program (IRP) Site 12. Site 12 and three nearby sites where underground storage tanks were removed, IRP sites 25, 30, and 47, make up the AC&W Operable Unit.

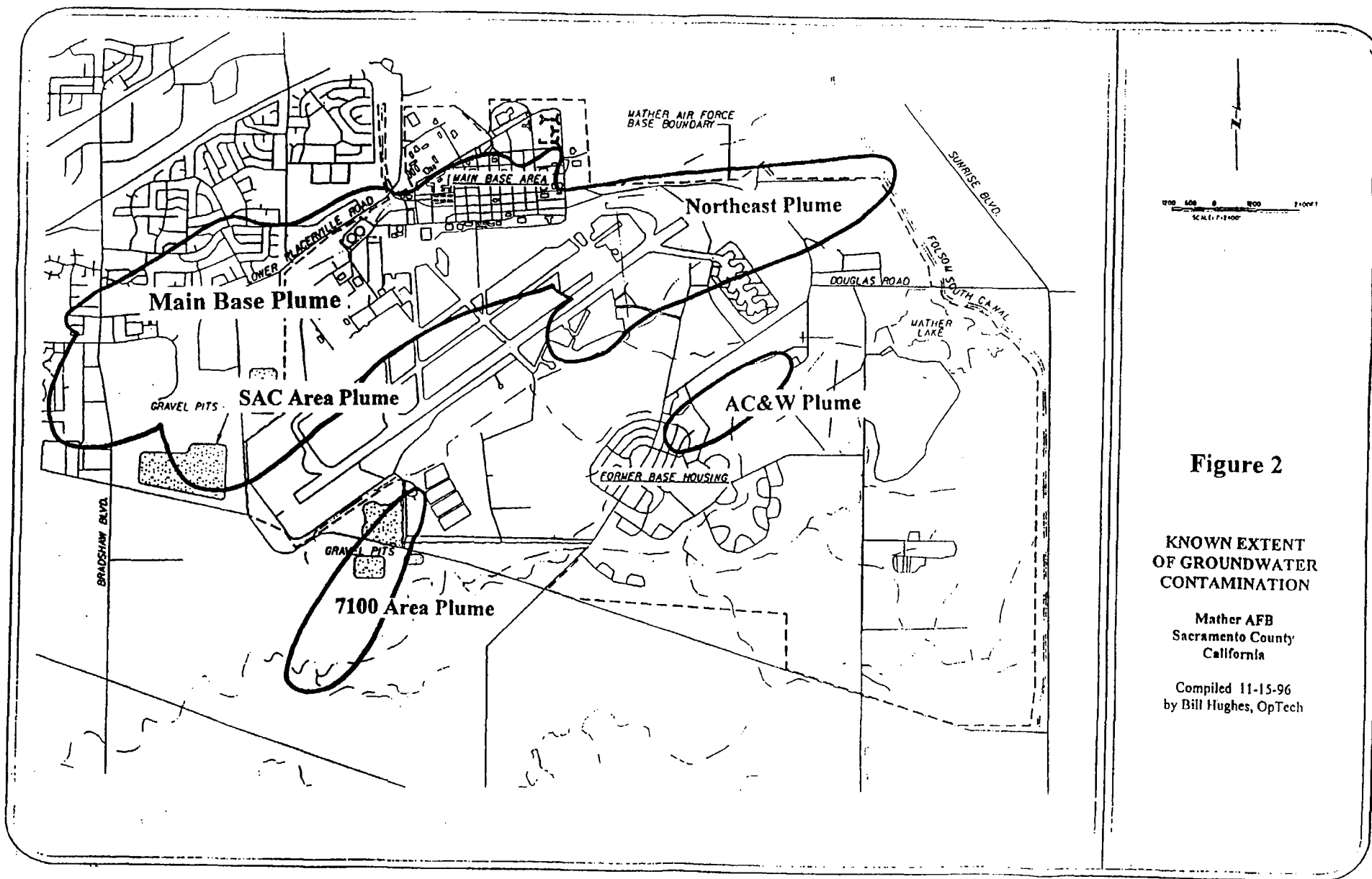
The water supply well serving the AC&W area was found to be contaminated with trichloroethene (TCE) in sampling conducted by the Air Force in 1979. Follow-on investigations in the 1980's revealed a TCE plume extending from the vicinity of the radar site about a mile southeast to the family housing area, predominantly in the upper 60 feet of the aquifer. The maximum concentrations of TCE were about 1 mg/l.

Table 2 presents a summary of previous investigations, reports of which contain detailed information about the AC&W groundwater contamination plume.

The AC&W Record of Decision was signed in December 1993 (AFBCA, 1993b), and a pump-and-treat remedial action began operating in January 1995. The system was designed to operate at 270 gallons per minute (gpm) but only 45 – 65% of this capacity was used because the reinjection system could not accommodate the design flow. In June 1997, the treated water was diverted from the injection system to surface water discharge at Mather Lake, in accordance with an Explanation of Significant Difference (AFBCA, 1997a) authorizing and documenting this change. Since then the system has been operating at about 250 gpm. The influent concentration has dropped from about 130 micrograms per liter (ug/l) during 1995 to about 60 ug/l during 1998. Some of this concentration change may be attributable to the increased extraction rate associated with the change in discharge method.







**Figure 2**

**KNOWN EXTENT  
OF GROUNDWATER  
CONTAMINATION**

**Mather AFB  
Sacramento County  
California**

Compiled 11-15-96  
by Bill Hughes, OpTech

Table 2. Previous Investigations of the AC&amp;W Groundwater Plume

<b>Previous Investigations of the AC&amp;W Groundwater Plume</b>	<b>Report Reference</b>
Installation Restoration Program (IRP) Phase II, Stage 1 Investigation	Roy F. Weston, 1986
IRP Phase II, Stage 3 Investigation	AeroVironment, 1988
Well Redevelopment and Sampling	IT, 1990a
Quarterly Routine Groundwater Sampling	EA Engineering, 1990a, 1990b, 1991
Site Inspection Report	IT, 1990b
Preliminary Design Investigation	IT Corp, 1992b
Quarterly Groundwater Monitoring	IT Corp, 1991a, b; 1992a, c, d, e; 1993a, d, e, h; 1994a, b, c, e; 1995a, c, d, e; 1996a
(Quarterly) Basewide Groundwater Monitoring	Montgomery Watson, 1996a,b,c; 1997a,c,d,f, h; 1998a,b,f, g, k, 1999i

The Air Force issued a report of proper and successful operation for the AC&W remedial action in September 1998 (AFBCA, 1998d), and received U.S. EPA concurrence in November 1998 (U.S. EPA, 1998). The remedial action will take more than five years to attain the cleanup standards. Therefore a five-year policy review is appropriate.

## 2.3 Groundwater OU History and Contamination Summary

The Groundwater Operable Unit (OU) consists of all groundwater contamination at and originating from Mather with the exception of the AC&W OU plume, which is addressed in a separate ROD (IT, 1993). The Groundwater OU has been subdivided into the Site 7 Plume, which appears to emanate from a source or historic source at the IRP Site 7 waste pit; the Northeast Plume, with apparent source(s) at the IRP Site 4 landfill; the Main Base Plume, with sources in the Main Base area; and the Strategic Air Command (SAC) Industrial Area Plume, with its principal source evident in the vicinity of IRP Site 57. The ROD combines the Main Base and SAC Area plumes for purposes of selecting the remedial alternative.

Contamination exists at the Groundwater OU plumes as a result of past USAF operations conducted between 1918 and 1993. The main sources of contamination include dry cleaning, industrial activities, equipment maintenance, landfill disposal, other waste disposal activities (i.e., Site 7), and fuels storage and delivery. Known vadose-zone sources are addressed as part of the Soil OU or the Basewide OU.

Table 3 presents a summary of previous investigations, for which the referenced reports contain detailed information about each plume of groundwater contamination.

**Table 3. Previous Investigations at the Groundwater Operable Unit Sites**

Groundwater Plume	Applicable Investigation
Main Base/Strategic Air Command Industrial Area	1,2,3,4,5,6,7,8,9,10,11,12,13, 14, 15
Site 7	1,2,3,4,5,6,7,8,9,10,11,12,13
Northeast	1,2,3,4,5,6,7,8,9,10,11,12,13

1. Installation Restoration Program (IRP) Phase II, Stage 1 Investigation [Weston 1986];
2. IRP Phase II, Stage 2 Investigation [AeroVironment 1987];
3. IRP Phase II, Stage 3 Investigation [AeroVironment 1988];
4. Sampling and Analysis Report for Site Monitoring Wells, October, November, 1988 [IT 1988a];
5. Site Inspection Report [IT 1990b];
6. Quarterly Routine Groundwater Sampling, 1990 [EA 1990a, 1990b, 1991];
7. Quarterly Routine Groundwater Sampling, 1991 - 1995 [IT 1991a, b; 1992a, c, d, e; 1993a, d, e, h]
8. 1994a, b, c, e; 1995a, c, d, e; 1996a];
9. Group 2 Sites Remedial Investigation Report [IT 1993c];
10. Group 3 Sites Technical Memorandum [IT 1993f];
11. Soil Operable Unit (OU) and Groundwater OU Additional Field Investigation Report [IT 1994d];
12. Mather Baseline Risk Assessment Report [IT 1995f];
13. Groundwater OU and Soil OU Focused Feasibility Study Report [IT 1995b];
14. Quarterly Routine Groundwater Sampling, 1996 - 1998 [Montgomery Watson, 1996a,b, c; 1997a, c, d, f, h; 1998a, b, f, g, k, 1999i];
15. Additional Site Characterization Report [IT Corp., 1996b]; and
16. Deep Aquifer Characterization Report [Montgomery Watson, 1998d]

### 2.3.1 Main Base/ SAC Area Plume:

The Main Base/ SAC Area Plume is actually several plumes, consisting of groundwater contamination from several sources that has commingled in the aquifer. The combined plume extends from its upgradient boundary with the Northeast Plume, across the portion of Mather north of the runways, and more than a mile off base to the west, crossing westward beneath Bradshaw Road between Old Placerville Road and Kiefer Boulevard. Contaminants from this plume were first detected in private wells sampled by the Central Valley Regional Water Quality Control Board between 1979 and 1987. Between 1984 and the present, the Air Force has installed over 300 groundwater monitoring wells that are included in a routine sampling program and/or performance monitoring program with quarterly reporting.

The contaminants of concern identified in the ROD for the Main Base/ SAC plume are PCE; TCE; 1,1-dichloroethene (DCE); cis-1,2-DCE; 1,2-dichloroethane (DCA); carbon tetrachloride; total petroleum hydrocarbons reported as diesel (TPH-d); total petroleum hydrocarbons reported as gasoline (TPH-g); benzene; xylenes; chloromethane; and lead. The cleanup standards established in the ROD are presented in Table 5.

The ROD selected a remedial action that uses pump-and-treat technology, with removal of volatile contaminants by air stripping and reinjection (possibly in combination with other compatible discharge options) of the treated water into the aquifer. The ROD also calls for a phased implementation of the remedial action for the Main Base/SAC Area Plume. Phase I addresses 'hot spots' of groundwater contamination on-base, and began operation in April 1998, extracting groundwater at about 700 gallons per minute (gpm). Phase II, addressing off-base 'hot spots', and Phase III, augmenting Phase I capture, are planned for operation in late 1999 or early 2000.

The remedial action will take more than five years to attain the cleanup standards. Therefore a five-year policy review is appropriate.

### 2.3.2 Site 7 Plume:

The Site 7 Plume extends about a mile off base to the southwest from IRP Site 7. Groundwater contamination has consisted of TCE up to 180 ug/l, PCE up to about 35 ug/l, and lesser amounts of other chlorinated ethenes, ethanes and benzenes. Vinyl chloride concentrations were detected in well MAFB-41 starting abruptly in July 1996, and have been as high as 19 ug/l since. Sampling in 1998 has detected generally lower concentrations of contaminants than in the past.

The contaminants of concern (COCs) at Site 7 identified in the Superfund Record of Decision, Soil Operable Unit Sites and Groundwater Operable Unit Plumes (USAF, 1996) are PCE; TCE; 1,1-DCE; 1,2-DCA; vinyl chloride; total petroleum hydrocarbons reported as diesel (TPH-d); benzene; 1,4-dichlorobenzene; and chloromethane. Cleanup standards established in the ROD are presented in Table 5.

Remediation of the Site 7 Plume began in December 1998, using a single extraction well. Additional extraction wells will be installed after aggregate mining occurs in 1999. Meanwhile, additional piezometers were installed in January 1999 to improve plume definition and contribute to the information to be used in selecting extraction well locations and monitoring the aquifer response to the extraction wells.

The remedial action will take more than five years to attain the cleanup standards. Therefore a five-year policy review is appropriate.

### 2.3.3 Northeast Plume:

The Northeast Plume consists of a portion of groundwater contamination emanating from one or more source areas for PCE and DCE in the vicinity of the IRP Site 4 landfill, and a source 1,2-dichloropropane (DCP) in the vicinity of IRP Site 5 landfill. The Northeast Plume extends to the west-southwest until it merges with the Main Base Plume. The COCs identified in the ROD for the Northeast Plume are PCE; 1,2-DCE; carbon tetrachloride; chloromethane; and 1,2-DCP. However, only PCE and 1,2-DCE have been detected above their respective cleanup standards since the ROD was issued in 1996. The maximum concentrations detected in the Northeast Plume since the ROD was issued are 19 ug/l PCE and 15 ug/l 1,2-DCE. The cleanup standards for these COCs are 5 ug/l and 6 ug/l, respectively. Cleanup standards for all COCs established in the ROD are presented in Table 5.

The remedial action selected for the Northeast Plume is described in Section 3.2.4.1, and consists of long-term groundwater modeling. The remedy calls for reconsideration of active remediation if monitoring or modeling indicates that the contaminants will not meet cleanup standards within a reasonable time, or that significant migration of the contaminants will occur at concentrations above the cleanup standards which will impact public health or the environment.

The presumed source area for the plume, landfill site 4, has been closed with a cap to prevent percolation of rainwater through the buried refuse. The Northeast Plume is being monitored to observe whether the landfill closure will succeed in mitigating the concentrations of contaminants entering the groundwater from any residual source(s) within the landfill, and to observe dispersion of the plume. The remedial action will take more than five years to attain the cleanup standards. Normally in this situation, a five-year policy review is appropriate. However, because the remedial action is in place, with passive rather than active remediation, and because groundwater contamination may persist in excess of cleanup standards for well in excess of five years, during which time unrestricted use of the groundwater may not be advisable, a statutory review was conducted.

## 2.4 Soils OU History and Contamination Summary

Fourteen IRP sites in the Soils Operable Unit were selected for remediation in the Record of Decision for the Soils Operable Unit Sites and Groundwater Operable Unit Plumes. Of these, eight sites are undergoing remedial action that may require at least five years to complete, and therefore require five-year policy review. A brief history of each of the Soil Operable Unit sites follows; only those requiring a policy review are evaluated further in this report. Some sites are grouped together because of a common remedial action.

### 2.4.1 IRP Site 7/11

Site WP-07 (7100 Area Disposal Site) and Site FT- 1 (Existing Fire Training Area) have been combined for the purpose of implementing in situ treatment to remediate total petroleum hydrocarbons reported as diesel. Site 7 was a gravel pit used for disposal of construction rubble as well as petroleum, oil, and lubricant (POL) wastes during the time period from 1953 to 1966. Site 7 is the apparent source area for the Site 7 groundwater contaminant plume that extends off base to the south-southwest. The Air Force decided to use Site 7 to dispose of soil excavated from other IRP sites, and treated as necessary to meet municipal landfill acceptance criteria. This helped to fill in the former pit, and create a mound to shed rainwater. The site will be capped consistent with landfill closure regulations. Site 11 is adjacent to the north of Site 7, and was the location of a fire training area where waste fuels were burned as a part of training exercises. A newer, lined and monitored fire training pit was built in the same general area. The COCs identified in the ROD are total petroleum hydrocarbons reported as diesel, and reported as gasoline. The cleanup standards established in the ROD are presented in Table 5.

The remediation strategy employed by the Air Force has included operating a soil vapor extraction (SVE) system to remove the more volatile fuel constituents from the vadose zone, and evaluating the extracted vapor for chlorinated solvents in case there is residual, contamination that may still be contributing to the groundwater contamination plume. Once the landfill cap can be constructed without interfering with the in situ treatment, the cap will be constructed to cover the area containing buried solid waste.

An SVE system was started for Site 11 in November, 1998, and an SVE system was started for Site 7 in December, 1998. In addition, groundwater extraction and treatment began for the Site 7 plume in December, 1998. The in situ remediation systems for sites 7 and 11 are described in the Draft Informal Technical Information Report for Site 7/11 (Montgomery Watson, 1998). The Draft Operation and Maintenance Manual for Site 7/11 was issued in October 1998 and is scheduled to become final in March 1999.

The remedial action may take more than five years to attain the cleanup standards. Therefore a five-year policy review is appropriate.

### 2.4.2 IRP Site SD-13

Site 13, Drainage Ditch No. 1, also includes the site of an oil-water separator associated with an aircraft wash rack, and a depression investigated for soil contamination. The site 13 ditch received storm-water runoff from off base, and may have also received overflow from the oil-water separator. COCs were identified in the ROD for surface water, sediment, and soils. The COCs identified in surface water were all metals. The COCs identified in the ROD for sediment are metals and pesticides. The COCs identified in the ROD for surface soils are metals, petroleum products, and polyaromatic hydrocarbons (PAHs, also known as polynuclear aromatic hydrocarbons, or PNAs). The cleanup standards established in the ROD are presented in Table 5.

The remedial action for Site 13 included these major components:

- removing surface water, if present, by pumping and discharging to the publicly owned treatment works (POTW);
- excavating approximately 1,900 cubic yards (yd<sup>3</sup>) of contaminated sediments and surface soils to remove all contamination above acceptable levels;
- transporting the excavated soils to the on-base ex situ bioremediation facility;
- treating the excavated soils by ex situ bioremediation as appropriate,
- transporting the treated soils to, and consolidating them with landfill cap foundation materials at Site 7, as appropriate; and
- monitoring the groundwater if contamination that threatens groundwater quality remains at the site, and monitoring surface water if contamination that threatens surface water quality remains at the site.

The contaminated sediment and surface soil at Site 13 was successfully excavated in 1997, and the remedial action was documented in the Site 13 Closure Report, dated July 1998. No surface water was present during the remediation, and the remedial project managers for the Air Force, U.S. EPA, and the State of California agreed that once cleanup of the sediment in the ditch occurred, future surface water would not be contaminated by environmental contamination at this site. The closure report concluded that the remedial action achieved the site cleanup standards established in the ROD, to allow clean closure of the site. Therefore, no five-year review is required for Site 13.

### 2.4.3 IRP Site SD-15

Site 15, Drainage Ditch No. 3, also known as the West Ditch, drains the former Strategic Air Command portion of Mather. Prior to the 1970's, it received some discharge of industrial waste; these discharge lines were later connected to the sanitary sewer system.

COCs were identified in the ROD for surface water and sediment at Site 15. The COCs identified in surface water were all metals. The COCs identified in the ROD for sediment are metals, pesticides, petroleum products, and PAHs. The cleanup standards established in the ROD are presented in Table 5.

The remedial action for Site 15 included these major components:

- removing surface water, if present, by pumping and discharging to the POTW;

- excavating approximately 4,300 yd<sup>3</sup> of contaminated sediments to remove all contamination above acceptable levels;
- transporting the sediments to the on-base ex situ bioremediation facility;
- treating the excavated sediments by ex situ bioremediation as appropriate;
- transporting the treated sediments to, and consolidating them with landfill cap foundation materials at Site 7, as appropriate; and
- monitoring the surface water if contamination that threatens surface water quality remains at the site.

Site 15 remediation began in 1997, was suspended during the wet winter months, and was completed in 1998. The remedial action is documented in the Informal Technical Information Report for Remedial Action at Sites 15, 20, 85, 86, and 87 (Montgomery Watson, 1999g). No residual contamination was identified at the site at the completion of the remedial action, and clean closure is expected to be the accepted recommendation for the site once the closure report is finalized. Therefore, if the closure report is accepted, no five-year review will be required for Site 15.

#### 2.4.4 IRP Site ST-20

Site 20 is the former wastewater treatment plant, which includes the site of a former motor gasoline underground storage tank (UST), sludge drying beds and surrounding soil where sewage sludge may have been spilled. Contaminants of concern for the sludge drying beds were established in the ROD for the Soils Operable Unit. Contaminants of concern were established for additional soil areas at Site 20 in the ROD for the Basewide Operable Unit. The cleanup standards for all COCs established in the RODs are presented in Table 5.

The remedial action selected for Site 20 in the Soils OU ROD included the following major components. Please note that additional remedial action for Site 20 was incorporated into the Basewide OU.

- excavating approximately 550 yd<sup>3</sup> of TPH-contaminated shallow soils to remove all contamination above acceptable levels;
- transporting the excavated soils to the on-base ex situ bioremediation facility;
- treating the excavated soils by ex situ bioremediation as appropriate;
- transporting the treated soils to, and consolidating them with landfill cap foundation materials at Site 7, as appropriate;



- removing sludge and disposing as appropriate in accordance with 1994 RAM for Site 20 (i.e. either disposal as hazardous waste, or treatment to render it nonhazardous and non-designated for on-base disposal); and
- monitoring the groundwater if contamination that threatens groundwater quality remains at the site.

The remedial action selected for Site 20 under the Basewide OU included these additional components:

- Excavating and transporting approximately 500 cubic yards of contaminated surface soils to the Mather Soil Bioremediation Facility.
- Ex situ bioremediation of excavated surface soils if necessary until Site 7 acceptance criteria for PAHs are achieved. Compliance with the acceptance criteria will be verified with post treatment confirmation soil sampling and analysis.
- Transporting the treated Site 20 soils from the Mather Soil Bioremediation Facility to Site 7 for use as foundation material in construction of a cap if the soils meet Site 7 acceptance criteria or to an appropriate off-base disposal facility.
- Installing one additional groundwater monitoring well at the site. Compliance with cleanup standards will be verified with groundwater monitoring.
- Groundwater monitoring for phthalates and diesel would be conducted for four quarters. If non-detect, monitoring would be discontinued.

A closure report for the initial cleanup of contamination identified in the Soils Operable Unit was issued (Montgomery Watson, 1997). The remedial action identified in the Basewide Operable Unit ROD was completed in 1998, and documented in Informal Technical Information Report for Remedial Action at Sites 15, 20, 85, 86, and 87 (Montgomery Watson, 1999g). This report is planned to be finalized as an 'informal technical information report', and full closure for these sites to be addressed in a separate document. No residual contamination judged to threaten human health, ecologic receptors, or water quality was identified at the site at the completion of the remedial action, although groundwater monitoring for one year will be conducted to confirm this for phthalates and diesel. Site closure is expected to be the accepted recommendation for the site once the closure report is finalized. Therefore, if the closure report is accepted, no five-year review will be required for Site 20.

### 2.4.5 IRP Site 37/39/54

Sites ST-37, ST-39, and SS-54 have been combined for the purpose of implementing in situ treatment to remediate petroleum constituents. Site 37 is a site where 5 USTs were removed. Site 39 was the former hazardous waste storage yard, and prior to that a storage and distribution point for aviation gasoline. Site 39 also contained pipelines and fuel filter sumps. Eight USTs were removed from Site 39. Site 54 was the Aerospace Ground Equipment (AGE) Repair Shop and contained a hazardous waste accumulation point. The COCs identified in the ROD are fuel components and oil and grease. The cleanup standards established in the ROD are presented in Table 5.

A soil vapor extraction system was constructed in summer 1998, and after a period of start-up and troubleshooting, became operational in December 1998. The Operations and Maintenance Manual was issued in February 1998 (Montgomery Watson, 1998).

The remedial action may take more than five years to attain the cleanup standards. Therefore a five-year policy review is appropriate.

### 2.4.6 IRP Site SS-56

Site 56 was the site of an oil-water separator at the Old Motor Pool Washrack, Facility 2989. The COCs identified in the ROD for the Soils Operable Unit are metals, PAHs, and petroleum constituents. The oil-water separator and surrounding soil were excavated according to the remedial action selected in the ROD, but some contamination remained. As a result, additional remediation by in situ methods was chosen by the Air Force to address the residual contamination, and documented in an Explanation of Significant Difference (AFBCA, 1998e). The cleanup standards established in the ROD are presented in Table 5.

The excavation remedy was documented in the Closure Report for Soil Operable Unit Site 65 and Remedial Action Characterization Report for Soil Operable Unit Sites 56, 59, 60, and 62 (Montgomery Watson, 1997b). The additional in situ treatment remedy is described in the Technical Information Report for Remedial Action at Sites 56 and 60 (Montgomery Watson, 1999k) and the Operations and Maintenance Manual and Manufacturers Literature for Soil Vapor Extraction/ Bioventing Systems at Sites 56 and 60 (Montgomery Watson, 1998m).

The remedial action may take more than five years to attain the cleanup standards. Therefore a five-year policy review is appropriate.

#### 2.4.7 IRP Site SS-57

Site 57 was the AGE Washrack oil-water separator, Facility 7019. The COC identified in the ROD is trichloroethene (TCE). A soil gas plume of TCE extends from this apparent source area to the southwest, overlying the heart of the TCE groundwater plume at the water table. A soil vapor extraction system began operating at Site 57 in October 1997. The initial TCE extraction rate was about 20 – 30 pounds per day for the first 75 days of operation, over about six months. Over the first year, the extraction rate tailed off to about 2 pounds per day. As of September 1998, an estimated 2600 pounds of volatile contaminants had been extracted, about 1800 pounds of which were TCE.

The latest information for the remedial action at Site 57 is found in the Informal Technical Information Report for Phase I and Phase II Remedial Action at Site 57 (Montgomery Watson, 1998i). The Operations and Maintenance Manual for the Site 57 Soil Extraction System was issued in 1997 (Montgomery Watson, 1997g).

The remedial action may take more than five years to attain the cleanup standards. Therefore a five-year policy review is appropriate.

#### 2.4.8 IRP Site SS-59

Site 59 was the ATC Washrack oil-water separator, Facility 4251. The COCs identified in the ROD are total petroleum hydrocarbons reported as diesel and as gasoline. The cleanup standards established in the ROD are presented in Table 5.

The oil-water separator and surrounding soil were excavated according to the remedial action selected in the ROD, but some contamination remained. As a result, additional remediation by in situ methods was chosen by the Air Force to address the residual contamination, and documented in an Explanation of Significant Difference (AFBCA, 1998e).

The excavation remedy was documented in the Closure Report for Soil Operable Unit Site 65 and Remedial Action Characterization Report for Soil Operable Unit Sites 56, 59, 60, and 62 (Montgomery Watson, 1997b). The additional in situ treatment remedy is described in the Draft Informal Technical Information Report and Preliminary Engineering Report for Vadose Zone Source Removal at Sites 18, 23, and 59 (Montgomery Watson, 1999f).

The remedial action may take more than five years to attain the cleanup standards. Therefore a five-year policy review is appropriate.

## 2.4.9 IRP Site SS-60

Site 60 was the Maintenance Dock North oil-water separator, Facility 6900. The COCs identified in the ROD are xylenes and total petroleum hydrocarbons reported as gasoline. The cleanup standards established in the ROD are presented in Table 5.

The remedial action selected for Site 60 included the following major components:

- excavating approximately 350 yd<sup>3</sup> of contaminated shallow soils to remove all contamination above acceptable levels;
- transporting the excavated soils to the on-base ex situ bioremediation facility;
- treating the excavated soils by ex situ bioremediation as appropriate;
- transporting the treated soils to, and consolidating them with landfill cap foundation materials at Site 4 or Site 7, as appropriate; and
- monitoring the groundwater if contamination that threatens groundwater quality remains at the site.

The excavation remedy was implemented according to the ROD. However, some contamination remained and additional excavation was not practical due to the depth limitations and the proximity of the adjacent aircraft maintenance hangar. Therefore the Air Force decided to initiate additional remedial action by in situ treatment.

The excavation remedy was documented in the Closure Report for Soil Operable Unit Site 65 and Remedial Action Characterization Report for Soil Operable Unit Sites 56, 59, 60, and 62 (Montgomery Watson, 1997b). Documentation of the additional in situ treatment remedy are contained in the Technical Information Report for Remedial Action at Sites 56 and 60 (Montgomery Watson, 1999k), and the Operations and Maintenance Manual and Manufacturers Literature for Soil Vapor Extraction/ Bioventing Systems at Sites 56 and 60 (Montgomery Watson, 1998m).

The remedial action may take more than five years to attain the cleanup standards. Therefore a five-year policy review is appropriate.

## 2.4.10 IRP Site OT-62

Site 62 was the Old Jet Engine Test Stand (Facility 7099), including oil-water separator 7110. The COCs identified in the ROD are metals, PAHs, and total petroleum hydrocarbons reported as diesel. The cleanup standards established in the ROD are presented in Table 5.

The remedial action selected for Site 62 includes the following major components:

- excavating approximately 500 yd<sup>3</sup> of contaminated surface and shallow soils to remove all contamination above acceptable levels;
- transporting the excavated soils to the on-base ex situ bioremediation facility;
- treating the excavated soils by ex situ bioremediation as appropriate;
- transporting the treated soils to, and consolidating them with landfill cap foundation materials at Site 4 or Site 7, as appropriate; and
- monitoring the groundwater if contamination that threatens groundwater quality remains at the site.

The contaminated soil at Site 62 was excavated in accordance with the remedial action selected in the ROD. The excavation remedy was accomplished in two phases; the first is documented in the Closure Report for Soil Operable Unit Site 65 and Remedial Action Characterization Report for Soil Operable Unit Sites 56, 59, 60, and 62 (Montgomery Watson, 1997b), in which additional excavation is recommended. The additional excavation was completed, and documented in the Closure Report and Remedial Action Characterization Report for Soil Operable Unit Site 62 (Montgomery Watson, 1997h). Therefore, a five-year review is not necessary for Site 62.

#### 2.4.11 Site SD-65

Site 65 is the former location of oil-water separator 6910 that served the Aerospace Ground Equipment (AGE) shop at Building 7009. The COCs identified at Site 65 were chromium, lead, diesel, gasoline, and oil and grease.

The remedial action selected for Site 65 included the following major components:

- excavating approximately 900 yd<sup>3</sup> of contaminated surface and shallow soils to remove all contamination above acceptable levels;
- transporting the excavated surface soils to an off-base disposal facility;
- transporting the excavated shallow soils to the on-base ex situ bioremediation facility;
- treating the excavated shallow soils by ex situ bioremediation as appropriate;
- transporting the treated soils, and consolidating them with landfill cap foundation materials at Site 4 or Site 7, as appropriate; and

- monitoring the groundwater if contamination that threatens groundwater quality remains at the site.

The remedial action was accomplished in 1996, and documented in the Closure Report for Soil Operable Unit Site 65 and Remedial Action Characterization Report for Soil Operable Unit Sites 56, 59, 60, and 62 (Montgomery Watson, 1997b). The excavation remedial action achieved the cleanup levels, and therefore, a five-year review is not required for Site 65.

#### 2.4.12 IRP Site OT-69

Site 69 was the Ordnance Burning/ Ordnance Disposal Pit. The COCs identified in the ROD are metals, dioxins, and furans. The cleanup standards established in the ROD are presented in Table 5.

The remedial action selected for Site 69 included the following major components:

- removing surface water, if present, by pumping and discharging to the POTW;
- excavating approximately 8,680 yd<sup>3</sup> of contaminated sediments and surface soils to remove all contamination above acceptable levels;
- transporting the excavated sediments and surface soils to, and consolidating them with landfill cap foundation materials at Site 4, as appropriate; and
- monitoring surface water as appropriate if contamination remains at the site that threatens surface water quality.

Surface soil was removed from Site 69 during the landfill consolidation as part of the remedial action for the Landfill Operable Unit sites, and incorporated into the foundation of landfill Site 4. Sediment remains to be excavated from the drainage at the site to complete the remedial action. The remedial action is expected to be complete within five years, and is not expected to result in contamination remaining on site that threatens human health or the environment. Therefore a five-year review is not required for Site 69 unless the remedial action extends beyond five years.

### 2.5 Landfill OU History and Contamination Summary

Contamination exists at the Landfill OU sites as a result of past Air Force operations conducted between 1918 and 1974. The landfills were mainly used for the disposal of general and sanitary refuse. In addition to garbage and household trash, it was reported that petroleum, oil, and lubricant (POL) wastes, as well as waste solvents, primarily

trichloroethene (TCE), may have been disposed in the landfills. It was also reported that daily burning of the refuse occurred at two of the landfills (Sites 3 and 4).

Investigations of the landfill sites are reported in the following documents:

- IRP Records Search for Mather AFB, Phase I, June 1982 [CH2M-Hill, Inc., 1982];
- IRP Phase II, Stage 2 Investigation, June 1987 [Aero Vironment 1987];
- Sampling and Analysis Report for Site Monitoring Wells [IT, 1990a];
- Quarterly Routine Groundwater Sampling, 1990 to present [EA 1990a, 1990b, 1991], [IT Corp, 1991a,b; 1992a,c, d, e; 1993a,d, e, h; 1994a,b, c, e; 1995a,c, d, e; 1996a]; [Montgomery Watson, 1996a,b, c; 1997a,c, d, e, f, 1998a,b, f, g, j, 1999i]
- Landfill Gas Testing Report, July 1988 [IT 1988];
- Site Inspection Report, August 1990 [IT 1990b];
- Group 2 Sites Remedial Investigation Report, April 1993 [IT 1993c];
- Solid Waste Assessment Test Report, March 1993 [IT 1993b]; and
- Landfill OU Focused Feasibility Study (FFS) Report, October 1993 [IT 1993g].

Five IRP sites were selected for remediation in the Record of Decision for the Landfill Operable Unit (AFBCA, 1995). Sites 3 and 4 are capped landfills, where the remedy is in place but at which unrestricted land use is not allowed; therefore these sites require a statutory five-year review. The other sites have been successfully remediated, with groundwater monitoring continuing in accordance with the ROD. A brief history of each of these sites follows.

### 2.5.1 IRP Site LF-02

Site 2 is located northwest of the Aircraft Control and Warning (AC&W) OU Site Area along the western fence-line of the former Strategic Air Command (SAC) alert parking apron (see Figure 1). The site was reportedly the main sanitary landfill for the Base from 1942 to 1950. Limited information is available concerning past operations conducted at the landfill.

The Landfill Operable Unit ROD selected capping as the remedial action. However, two changes were made after the ROD that altered the remedy.

During site preparation, as soil containing sporadic waste was removed from a drainage swale, it was determined that consolidation within Site 2 would raise the cap to a degree that it would require relocating overhead power lines, and a decision was made to dispose of the soil and waste from the Site 2 drainage swale at the Site 4 consolidation site. This decision was documented in the Explanation of Significant Differences from the Landfill Operable Unit Record of Decision (USAF, 1996e).

As work progressed, it became apparent that there was less waste at Site 2 than estimated in the Landfill OU Focused Feasibility Study (AFBCA, 1993a) and that it would be cost-effective to consolidate the remaining contents of Site 2 into the Site 4 landfill. This decision was documented in a time-critical removal action memorandum (AFBCA, 1996c) in order to accomplish the consolidation without extending the Site 4 operations into wet winter weather at additional cost. The waste was successfully removed, and groundwater monitoring has detected no contamination associated with Site 2. Assuming this historic pattern of no groundwater detections associated with Site 2 continues, monitoring for Site 2 will terminate no later than at the end of 1999. Therefore, if the closure of this site is approved within five years of the initiation of remedial action, no five-year review will be required for this site.

The Basewide OU ROD (AFBCA, 1998b) confirmed that the removal action for Site 2 constituted the final remedial action for Site 2.

### 2.5.2 IRP Site LF-03

Site 3 was reportedly the main sanitary landfill for the Base from 1950 through 1967. Site 3 is located in the northeast corner of the Mather (see Figure 1). Refuse was reportedly placed in trenches, burned, and covered daily. The backfilled trenches were discernable at the surface of the site where settlement of the refuse and surface cover cracking had occurred. In addition to refuse, the following items were also reportedly disposed at this site: drummed POL wastes; hospital wastes; waste paint and thinners; and empty pesticide containers.

The Landfill Operable Unit ROD (AFBCA, 1995) selected capping as the remedial action. The site was capped in 1996; gas monitoring and groundwater monitoring continue. The remedial action requires a minimum of thirty years of post-closure monitoring and maintenance; and may not permit unrestricted use even if monitoring one day ends. Therefore, a statutory five-year review is required for Site 3.



### 2.5.3 IRP Site LF-04

Site 4 is adjacent to and east of Site 3 (see Figure 1), and was reportedly the main sanitary landfill site for the entire Base from 1967 through 1971. Operations were reportedly similar to those conducted at Site 3, and included daily filling, burning, and covering operations. During the site investigations, the trenches were discernable across the surface due to settling and extensive surface cracking. A POL waste disposal pit was reportedly located at the northeast corner of the site and was in operation for approximately two years during the late 1960s. Trichloroethene was thought to have possibly been present in the POL waste, but tetrachloroethene (also known as PCE) and cis-1,2-dichloroethene (DCE) are the primary groundwater contaminants in the area.

The Landfill Operable Unit ROD (AFBCA, 1995) selected capping as the remedial action, in conjunction with consolidation of wastes from sites 5 and 6. Later, as explained above, waste from Site 2 was also consolidated at Site 4. The Landfill Operable Unit ROD selected capping as the remedial action. The site was capped in 1996, with vegetation completed in 1997; gas monitoring and groundwater monitoring continue.

To date, methane gas migration in excess of the 5% limit is occurring on the north and west sides of the Site 4 landfill. It has diminished since a gas-venting trench was installed in 1998. A contingency plan addresses the additional actions that will be taken to reduce the methane migration should it persist in excess of the 5% limit, or if development occurs on the adjacent land such that the landfill gas migration poses an unacceptable health risk (Montgomery Watson, 1999e).

Landfill Site 4 is also the apparent source for groundwater contamination being monitored as part of the Northeast Plume, described elsewhere in this report.

The remedial action requires a minimum of thirty years of post-closure monitoring and maintenance; and may not permit unrestricted use even if monitoring one day ends. Therefore, a statutory five-year review is required for Site 4.

### 2.5.4 IRP Site LF-05

Site 5, which was located south of Site 4, was the main sanitary landfill during 1971 (see Figure 1). This site consisted of two major east-west trending trenches and an apparently narrower trench, which extends further to the east. The location of the major trenches was visible due to extensive cracking and settling of the surface soils. Following disposal in the landfill, the wastes were covered without being burned. Small quantities of drummed POL wastes may have been disposed at this site.

The selected remedy for Site 5 was excavation and consolidation (AFBCA, 1995). The major components of this remedy included:

- excavating the landfill materials;
- transporting the material to, and consolidating it with the landfill materials at Site 4; and
- monitoring the groundwater.

The remedial action for Site 5 was accomplished in 1996. Groundwater monitoring has, continued since, with the only constituent detected being 1,2-dichloropropane (1,2-DCP). 1,2-DCP has been detected in two monitoring wells at about half its cleanup standard for the Northeast Plume. Assuming this historic pattern of no groundwater detections above cleanup standards associated with Site 5 continues, monitoring for Site 5 will terminate no later than at the end of 1999. Groundwater monitoring will continue for the Northeast Plume as appropriate. Therefore, if the closure of this site is approved within five years of the initiation of remedial action, no five-year review will be required for this site.

### 2.5.5 IRP Site LF-06

Site 6 was located in the southeastern portion Mather AFB and was the main sanitary landfill site for the Base from 1972 through 1974 (see Figure 1). Site 6 consisted of two soil-covered landfills, one north and one south of an intermittent stream channel. Refuse (primarily garbage and household trash) was dumped into the landfill trenches. Small quantities of drummed used and unused paint thinners, and POL wastes were reportedly disposed at this site. Extensive settling and surface cracking of the surface soil was evident at both landfills.

The selected remedy for Site 6 was excavation and consolidation. The major components of this remedy included:

- excavating the landfill materials;
- transporting the material to, and consolidating it with the landfill materials at Site 4; and
- monitoring the groundwater.

The remedial action for Site 6 was accomplished in 1996. Groundwater monitoring has continued since, with no detections of organic contaminants. However, elevated concentrations of metals have been detected in the groundwater, most notably from the most upgradient well. It is thought that these detections may be caused by the stainless steel well screen in the monitoring wells, as the metals are all used in stainless steel alloys, but this hypothesis has not been proven. It is not expected that the metals detected in groundwater samples will preclude site closure or require additional remedial action. Therefore, a policy review was not conducted for Site 6, but the status of Site 6 should be confirmed in the next five-year review. If the closure of this site is approved within five years of the initiation of remedial action, no five-year review will be required for this site.

## **2.6 Basewide OU History and Contamination Summary**

Six IRP sites were selected for remediation in the Record of Decision for the Basewide Operable Unit (AFBCA, 1998b), five of which received a five-year policy review reported herein. These five sites are Site 10C/68, Site 18, Site 23, and Site 87. Site 86 has been remediated, and approval of site closure is pending. Site 87, where at the conclusion of the remedial action it is expected that unrestricted land use will not be authorized, will require a statutory review in the next five-year review report. A brief history of each of these sites follows. Some sites are grouped together because of a common remedial action.

### **2.6.1 IRP Site 10C/68**

Site 10C was the site of fire training exercises from approximately 1947 - 1958. Site 68 is the adjacent site where a fuel storage facility once consisted of sixteen 50,000-gallon underground storage tanks used to store JP-4 jet fuel, as well as a fuel distribution manifold, pumps, and two associated 2,000-gallon tanks.

Site 10C was discovered during installation of groundwater monitoring wells; subsequent exploratory excavation revealed some buried debris and petroleum-contaminated soil. Prior to this discovery, IRP Site 10 was thought to be the location of the former fire training exercises. Reevaluation of historical aerial photography revealed that the Site 10 location had been misidentified, and that Site 10C does match the apparent fire training location on historic aerial photographs. After site investigation, the debris and associated soil was excavated and disposed of at the Site 4 landfill under a removal action memorandum (USAF, 1996d). The Basewide OU ROD selected in situ treatment as the remedial action to address the remaining COCs at sites 10C and 68. The COCs designated by the ROD are petroleum constituents and carbon tetrachloride for Site 10C, and petroleum measured as gasoline at Site 68. The COCs and cleanup levels established in the ROD are listed in Table 5.

The remedial action may take more than five years to attain the cleanup standards. Therefore a five-year policy review is appropriate.

### **2.6.2 IRP Site 18**

Site 18 is located adjacent to the aircraft-parking apron at the west end of the Main Base flight line. Originally identified as an IRP site because tool boxes and containerized ethyl mercaptan were reported buried there, no buried material was discovered during investigations, but the site was found to have chlorinated volatile organic contamination in the soil. This is thought to have resulted from aircraft washing activities on the nearby apron; an historic aerial photograph shows water ponded at Site 18.

The COCs and cleanup levels established in the ROD are listed in Table 5. Pilot tests have confirmed that soil vapor extraction is effectively able to remove chlorinated solvents from the soil at Site 18, and a soil vapor extraction system is planned for operation in 1999 (Montgomery Watson, 1999f) in accordance with the remedial action selected in the ROD (AFBCA, 1998b).

The remedial action may take more than five years to attain the cleanup standards. Therefore a five-year policy review is appropriate.

### 2.6.3 IRP Site SS-23

Site 23 was originally identified as two sections of sanitary sewer line identified as leaky. During the Group 2 remedial investigation (RI), the site was redefined to consist of all the sewer lines on the Main Base that drained buildings where TCE was reported as stored or used in the Records Search (CH2M Hill, 1982). Soil borings during the Group 2 RI identified no significant contamination associated with Site 23. During the Additional Site Characterization, an additional investigation focused on the portions of the sanitary sewer line that were located above water table contamination. A sewer line flushing and soil gas survey was conducted along the suspect lines, and although no significant contaminants were found within the sewer lines, contamination was identified in some of the soil gas samples collected in borings near the sewer lines. On this basis, the Basewide ROD identifies four areas (subsites 23a, 23b, 23c, and 23d) to be addressed during remedial action. An additional location along Site 23 was defined in 1998, near the site of a former dry cleaning plant where a major source of PCE contamination found. The COCs and cleanup levels established in the ROD are listed in Table 5. Soil vapor extraction is planned for implementation at these sites in 1999 (Montgomery Watson, 1999f).

The remedial action may take more than five years to attain the cleanup standards. Therefore a five-year policy review is appropriate.

### 2.6.4 IRP Site FR-86

IRP Site 86 was the small arms range for Mather, located in the southeastern portion of Mather, just east of Eagles Nest Road and north of Kiefer Boulevard. Lead was identified as the only COC in the ROD, as listed with its cleanup value of 130 ppm, in Table 5.

Uncontaminated portions of the backstop soil was excavated in 1996 and used during the landfill consolidation project. The remaining contaminated soil and bullet fragments were removed in 1998, processed to remove recoverable lead, and stabilized as necessary for use in building the foundation for the Site 7 cap. The project was completed in 1999, and documented in the Informal Technical Information Report for Remedial Action at

Sites 15, 20, 85, 86, and 87 (Montgomery Watson, 1999g). Full closure for these sites will be addressed in a separate remedial action report. Therefore, if site closure is approved, a five-year review will not be required for Site 86.

### **2.6.5 IRP Site FR-87**

Site 87 was a skeet and trap range at Mather located near the AC&W Site. It contained an area where clay pigeon fragments had accumulated, and an area of lead shot that encompassed part of Morrison Creek. The COCs and cleanup levels established in the ROD are listed in Table 5.

Remedial action consisting of excavation and stabilization was selected in the ROD. The contaminated soil, clay pigeon material, and lead shot were excavated in 1998. The soil was processed to remove recoverable lead, and stabilized as necessary for use in building the foundation for the Site 7 cap. The project was completed in 1999, and documented in the Informal Technical Information Report for Remedial Action at Sites 15, 20, 85, 86, and 87 (Montgomery Watson, 1999g). Full closure for these sites will be addressed in a separate remedial action report.

However, the remedial action was conducted with the cleanup standard for lead inconsistent with residential use. Therefore, unrestricted use of the property will not be permitted (unless post-excavation confirmation samples indicate that the remedial action achieved soil concentrations consistent with unrestricted use). Therefore a policy review is reported herein, and a statutory five-year review will be required when the next five-year review is conducted.

## **2.7 Supplemental Basewide OU History and Contamination Summary**

The Supplemental Basewide Operable Unit 6 consists of IRP sites 80, 85, 88, and 89. A Feasibility Study for these sites is in preparation as this review is conducted. A brief history of each of these sites follows.

### **2.7.1 IRP Site DD-80**

Site 80 is the Golf Course Maintenance Area Ditch. It was investigated during the Additional Site Characterization Remedial Investigation (IT Corp., 1996b). The potential COCs identified in the Basewide OU Focused Feasibility Study report are pesticides; however, cleanup standards were not agreed upon in time for the Basewide OU ROD. Consequently, additional site data has been collected and the site is incorporated into the Supplemental Basewide OU. The site data is evaluated in the Draft Supplemental Basewide OU FFS (IT, 1999), in preparation for soliciting public comment and preparing

a ROD for the Supplemental Operable Unit. Excavation was conducted in 1999 under a removal action memorandum in order that the excavated sediment could be used for landfill cap foundation material at Site 7 (AFBCA, 1999). The removal action may be sufficient to satisfy the final cleanup criteria; this will be assessed based upon the cleanup standards to be established in the ROD. It is anticipated that cleanup will be done within five years of the Supplemental Basewide OU ROD, and that it will result in unrestricted land use. Therefore, if cleanup is accomplished within five years of the Supplemental Basewide OU ROD, a five-year review will not be required for Site 80.

### 2.7.2 IRP Site DD-85

Site 85 is the South Ditch, an engineered drainage ditch that collects storm runoff from the southern half of Mather, as well as from the northern half via the Site 15 (West Ditch) and the Site 13 ditches. Site 85 was investigated as part of the Additional Site Characterization Remedial Investigation (IT Corp., 1996b). The potential COCs identified in the Basewide OU Focused Feasibility Study report are pesticides, polynuclear aromatic hydrocarbons, metals, and petroleum hydrocarbons. However, cleanup standards for pesticides were not agreed upon in time for the Basewide OU ROD. Consequently, Site 85 is incorporated into the Supplemental Basewide OU. The site data is evaluated in the Draft Supplemental Basewide OU FFS (IT, 1999), in preparation for soliciting public comment and preparing a ROD for the Supplemental Operable Unit.

While additional information was being collected at sites 80 and 88 in an effort to reach agreement on cleanup standards for pesticides, a removal action memorandum was issued for Site 85 (AFBCA, 1997b), and excavation was undertaken in 1998 to remove contamination from the Site 85 ditch. The project was completed in 1998, and documented in Informal Technical Information Report for Remedial Action at Sites 15, 20, 85, 86, and 87 (Montgomery Watson, 1999g). Once cleanup standards are established in the ROD for the Supplemental Operable Unit for Site 85, site closure for Site 85 will be reassessed and documented in a separate remedial action report.

It is anticipated that cleanup will be done within five years of the Supplemental Basewide OU ROD, and that it will result in unrestricted land use. Therefore, if cleanup of Site 85 is accomplished within five years of the Supplemental Basewide OU ROD, a five-year review will not be required for Site 85.

### 2.7.3 IRP Site DD-88

Site 88 is the Morrison Creek Reference Site. It was investigated during the Additional Site Characterization Remedial Investigation (IT Corp., 1996b). The potential COCs identified in the Basewide OU Focused Feasibility Study report are pesticides; however, cleanup standards were not agreed upon in time for the Basewide OU ROD. Consequently, additional site data has been collected and the site is incorporated into the

Supplemental Basewide OU. The site data is evaluated in the Draft Supplemental Basewide OU FFS (IT, 1999), in preparation for soliciting public comment and preparing a ROD for the Supplemental Operable Unit.

Excavation was conducted in 1999 under a removal action memorandum in order that the excavated sediment could be used for landfill cap foundation material at Site 7 (AFBCA, 1999). The removal action may be sufficient to satisfy the final cleanup criteria; this will be assessed based upon the cleanup standards to be established in the ROD.

It is anticipated that cleanup will be done within five years of the Supplemental Basewide OU ROD, and that it will result in unrestricted land use. Therefore, if cleanup is accomplished within five years of the Supplemental Basewide OU ROD, a five-year review will not be required for Site 88.

#### **2.7.4 IRP Site OT-89**

Site 89 is the site of a historic trap range that was used in the 1940s and 1950s. An investigation revealed that the two sets of firing stations were removed in the 1950s, and that the shot fall area of one of these was covered with imported fill to a depth of approximately 8–10 feet. The site data is evaluated in the Draft Supplemental Basewide OU FFS (IT, 1999), in preparation for soliciting public comment and preparing a ROD for the Supplemental Operable Unit.

It is expected that remedial action at Site 89 will not allow for unrestricted land use. Therefore, a statutory five-year review will be required when the next five-years review is conducted. However, as the ROD has not yet been issued, the five-year review for Site 89 consists merely of the information in this section.

### **2.8 Community Participation**

Information on community participation can be found in the Community Relations Plan for Mather AFB (AFBCA, 1996a), which summarizes the history of public participation in the environmental cleanup at Mather AFB. Prior to the formation of the Restoration Advisory Board (RAB) in 1994, public meetings were held at key milestones in the environmental cleanup program, such as when the Proposed Plan for the AC&W Site was issued for public comment in 1991 and again in 1992, or when alternative water supplies were being coordinated in the mid-1980's. In addition, Technical Review Committee meetings were held approximately four times a year from 1989 to 1993, and attended by a public member as well as representatives of elected officials.

Since 1994, the Restoration Advisory Board (RAB) has served to provide a greater opportunity for members of the public to learn about Mather's environmental cleanup program, to review and comment on environmental plans and reports, and to provide input to the Air Force and regulatory agencies on cleanup decisions. The RAB consists

of up to a dozen community members, and is co-chaired by a community member and the BRAC Environmental Coordinator for Mather. The RAB holds regular meetings open to the public, and meeting minutes are distributed to a mailing list of interested people. From 1994 through 1998, the RAB met approximately every six weeks. Starting in 1999, the RAB will meet about three times per year.

The Community Relations Program is more fully described in the Community Relations Plan for Mather (AFBCA, 1996a), an update of which will be issued in 1999.

The public participation requirement of CERCLA Sections 113(k)(2)(B)(i-v) and 117 were met through public comment periods and public meetings to address the Proposed Plan and content of supporting RI/FS documents for each of the first five operable units, as tabulated below. Responses to public comments received during each of the public comment periods are incorporated in the Responsiveness Summary section of the Record of Decision documents.

Table 4 summarizes the public comment periods for Mather's proposed plans.

Table 4: Public Participation in Remedy Selections for Mather AFB

Operable Unit	Public Comment Period	Public Meeting
AC&W	10/1 – 31/91 and 3/16 – 4/15/92	10/1/91 and 4/1/92
Landfill	2/1/94 – 3/3/94	2/15/94
Soil	5/8/95 - 6/7/95	5/18/95
Groundwater	5/8/95 - 6/7/95	5/18/95
Basewide	5/23 – 6/23/97	5/29/97
Supplemental Basewide	Planned for winter 1999 – 2000	Planned for winter 1999 – 2000



### 3.0 REMEDIAL OBJECTIVES AND EVALUATION

The remedial actions selected for CERCLA cleanup at Mather AFB are presented for each site, followed by an evaluation of the remedy at that site. The evaluation focuses on whether the remedial action functions as designed, whether the technologies used for cleanup are still effective, and whether the operation and maintenance is being performed adequately to avoid degradation of the remedial action.

The cleanup standards for each site are presented in Table 5 for reference.

Table 5: Cleanup Standards for Mather AFB IRP Sites		
IRP Site Number	Contaminant(s) of Concern	Cleanup Standard
LF-02	N/A	N/A
LF-03	N/A	N/A
LF-04	N/A	N/A
LF-05	N/A	N/A
LF-06	N/A	N/A
WP-07/FT-11	TPH as Diesel TPH as Gasoline	10 ppm 1 ppm
FT-10C	Carbon tetrachloride Benzene Ethylbenzen Toluene Xylenes TPH as Diesel TPH as Gasoline	Narrative Narrative Narrative Narrative Narrative 100 ppm 5 ppm
ST-68	TPH as Gasoline	5 ppm
WP-12	TCE	5 ug/l aquifer standard
SD-13	<i>Surface Water:</i> Aluminum Chromium Lead Manganese Silver Zinc <i>Sediment:</i> Arsenic Chromium Chromium VI Cobalt Copper Lead Mercury Nickel	6.28 ppm 11 ppb 9.4 ppb 100 ppb 16 ppb 54 ppb  16 ppm 176 ppm ND (100 ppb) 35 ppm 104 ppm 81 ppm ND (200 ppb) 81 ppm

Table 5: Cleanup Standards for Mather AFB IRP Sites		
IRP Site Number	Contaminant(s) of Concern	Cleanup Standard
SD-13 (continued)	Vanadium	153 ppm
	Zinc	116 ppm
	4,4-DDD	1.9 ppm
	4,4-DDE	1.3 ppm
	4,4-DDT	1.3 ppm
	alpha-Chlordane	340 ppb
	gamma-chlordane	340 ppb
	Dieldrin	28 ppb
	<i>Surface Soil:</i>	
	Arsenic	16 ppm
	Mercury	ND (200 ppb)
	Zinc	1559 ppm
	TPH as Diesel	100 ppm
	Oil and Grease	430 ppm
	Benzo(a)anthracene	330 ppb
	Benzo(g,h,i)perylene	330 ppb
	Fluoranthene	330 ppb
	Indeno(1,2,3-cd)pyrene	330 ppb
	Napthalene	330 ppb
	Pyrene	330 ppb
SD-15	<i>Surface Water:</i>	
	Chromium	11 ppb
	Lead	9.4 ppb
	Manganese	100 ppb
	Vanadium	100 ppb
	Zinc	54 ppb
	<i>Sediment:</i>	
	Barium	1300 ppm
	Cadmium	1.4 ppm
	Chromium	176 ppm
	Chromium VI	ND (100 ppb)
	Copper	104 ppm
	Lead	81 ppm
	Mercury	ND (200 ppb)
	Zinc	116 ppm
	Alpha-Chlordane	340 ppb
	Gamma-Chlordane	340 ppb
	Aroclor 1248	66 ppb
	Aroclor 1254	66 ppb
	Aroclor 1260	66 ppb
	Dieldrin	28 ppb
	TPH as Diesel	10 ppm
	TPH as Gasoline	1 ppm
	Oil and Grease	430 ppm

Table 5: Cleanup Standards for Mather AFB IRP Sites		
IRP Site Number	Contaminant(s) of Concern	Cleanup Standard
SD-15 (continued)	Acenaphthene	330 ppb
	Acenaphthylene	330 ppb
	Anthracene	330 ppb
	Benzo(a)anthracene	330 ppb
	Benzo(a)pyrene	330 ppb
	Benzo(b)fluoranthene	330 ppb
	Benzo(g,h,i)perylene	330 ppb
	Benzo(k)fluoranthene	330 ppb
	Chrysene	330 ppb
	Dibenzo(a,h)anthracene	330 ppb
	Fluoranthene	330 ppb
	Fluorene	330 ppb
	Indeno(1,2,3-cd)pyrene	330 ppb
	Napthalene	330 ppb
	Phenanthrene	330 ppb
	Pyrene	330 ppb
LF-18	<i>Soil vapor:</i>	
	Trichloroethene	Narrative
	1,2-DCE	Narrative
ST-20	<i>Surface Soil (sludge location, Soil Operable Unit):</i>	
	Lead	130 ppm
	Mercury	20 ppm
	Zinc	1559 ppm
	<i>Surface Soil (Basewide OU):</i>	
	Lead	130 ppm
	Benzo(a)anthracene	330 ppb
	Benzo(a)pyrene	330 ppb
	Benzo(b)fluoranthene	330 ppb
	Benzo(k)fluoranthene	330 ppb
	Phenanthrene	330 ppb
	<i>Subsurface Soil: (Basewide OU)</i>	
	TPH as Diesel	10 ppm
OT-23	<i>Soil Vapor:</i>	
	PCE	Narrative
	TCE	Narrative
	1,2 DCE	Narrative
	Xylenes	Narrative

Table 5: Cleanup Standards for Mather AFB IRP Sites		
IRP Site Number	Contaminant(s) of Concern	Cleanup Standard
ST-37	<i>Subsurface Soil:</i> TPH as Diesel TPH as Gasoline Oil and Grease	10 ppm 1 ppm 430 ppm
ST-39	<i>Surface Soil:</i> TPH as Diesel Oil and Grease <i>Subsurface Soil:</i> Benzene Ethylbenzene Toluene Xylene TPH as Diesel TPH as Gasoline	100 ppm 430 ppm 100 ppb 2.9 ppm 4.2 ppm 1.7 ppm 10 ppm 1 ppm
SS-54	<i>Subsurface Soil:</i> Benzene TPH as Gasoline	100 ppb 1 ppm
SD-56	<i>Surface Soil:</i> Arsenic Lead Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Chrysene Dibenzo(a,h)anthracene TPH as Diesel Oil and Grease <i>Subsurface Soil:</i> TPH as Diesel TPH as Gasoline Oil and Grease	22 ppm 130 ppm 330 ppb 330 ppb 330 ppb 330 ppb 330 ppb 100 ppm 430 ppm 100 ppm 5 ppm 430 ppm
SD-57	Trichloroethene	Narrative*
SD-59	<i>Subsurface Soil:</i> TPH as Diesel TPH as Gasoline	10 ppm 1 ppm
SD-60	<i>Subsurface Soil:</i> Xylenes TPH as Gasoline	17 ppm 5* ppm

Table 5: Cleanup Standards for Mather AFB IRP Sites		
IRP Site Number	Contaminant(s) of Concern	Cleanup Standard
OT-62	<i>Surface Soil:</i> Cadmium Lead Zinc Benzo(k)fluoranthene Fluoranthene Naphthalene Pyrene TPH as Diesel <i>Subsurface Soil:</i> Benzo(a)pyrene TPH as Diesel	9 ppm 130 ppm 1559 ppm 330 ppb 330 ppb 330 ppb 330 ppb 10 ppm 330 ppb 10 ppm
SD-65	<i>Surface Soil:</i> Chromium Lead TPH as Diesel Oil and Grease <i>Subsurface Soil:</i> TPH as Diesel TPH as Gasoline	210 ppm 130 ppm 10 ppm 430 ppm 10 ppm 1 ppm
OT-69	<i>Surface Water:</i> Barium Manganese <i>Sediment:</i> Octachlorodibenzo-p-dioxin Octachlorodibenzofuran Total heptachlorodibenzo-p-dioxin Total heptachlorodibenzofuran Total hexachlorodibenzo-p-dioxin Total hexachlorodibenzofuran Total pentachlorodibenzo-p-dioxin Total pentachlorodibenzofuran Total tetrachlorodibenzofuran <i>Surface Soil:</i> Barium Zinc Octachlorodibenzo-p-dioxin Octachlorodibenzofuran Total heptachlorodibenzo-p-dioxin Total heptachlorodibenzofuran Total hexachlorodibenzo-p-dioxin Total hexachlorodibenzofuran Total pentachlorodibenzo-p-dioxin Total pentachlorodibenzofuran Total tetrachlorodibenzofuran	1 ppm 100 ppb 5 ppt total 2,3,7,8-TCDD equivalent (TCDD = tetrachlorodibenzo-p-dioxin) 1754 ppm 1559 ppm 5 ppt total 2,3,7,8-TCDD equivalent (TCDD = tetrachlorodibenzo-p-dioxin)
SD-80	TBD	
SD-85	TBD	

Table 5: Cleanup Standards for Mather AFB IRP Sites		
IRP Site Number	Contaminant(s) of Concern	Cleanup Standard
OT-86	Lead	130 ppm
OT-87	<i>Sediments:</i> Arsenic Lead <i>Surface Soil:</i> Lead Benzo(a)pyrene Benzo(g,h,i)perylene Dibenzo(a,h)anthracene Fluoranthene Phenanthrene	9.6 ppm 15.5 ppm (& pellet removal)  700 ppm 330 ppb 330 ppb 330 ppb 330 ppb 330 ppb
DD-88	TBD	
OT-89	TBD	
Main Base/SAC Plume	PCE TCE 1,1-dichloroethene (DCE) cis-1,2-DCE 1,2-dichloroethane (DCA) carbon tetrachloride TPH as Diesel TPH as Gasoline Benzene Xylenes Chloromethane Lead	5 ug/l 5 ug/l 6 ug/l 6 ug/l 0.5 ug/l 0.5 ug/l 100 ug/l 5 ug/l 1 ug/l 17 ug/l 3 ug/l 15 ug/l
Northeast Plume	PCE Cis-1,2-DCE Carbon tetrachloride Chloromethane 1,2-DCP	5 ug/l 6 ug/l 0.5 ug/l 3 ug/l 5 ug/l
Site 7 Plume	PCE TCE 1,1-dichloroethene (DCE) cis-1,2-DCE Vinyl chloride 1,2-dichloroethane (DCA) 1,4-Dichlorobenzene Benzene Chloromethane TPH as Diesel	5 ug/l 5 ug/l 6 ug/l 6 ug/l 0.5 ug/l 0.5 ug/l 5 ug/l 1 ug/l 3 ug/l 100 ug/l

### **3.1 AC&W OU Selected Remedy and Remedial Objectives Evaluation**

#### **3.1.1 AC&W OU Selected Remedy**

The remedial action selected in the AC&W ROD (USAF, 1993) was extraction of contaminated groundwater, treatment by air stripping, and discharge of treated water by reinjection into the aquifer horizon from which it was extracted. The pump and treat system began operating in January 1995 with eight extraction and eight injection wells, but was only able to consistently operate at about half of design capacity of 270 gallons per minute. This was because the injection well capacity could not be maintained at sufficient levels to discharge the design capacity. The remedial action was modified in 1997 to change the discharge from reinjection to discharge into Mather Lake, thereby allowing the system to operate at the design capacity. This decision was documented an Explanation of Significant Difference (AFBCA, 1997a).

#### **3.1.2 AC&W OU Remedial Objectives Evaluation – Policy Review**

The objectives of the remedial action for the AC&W Site are to (1) achieve the cleanup standard of 5 micrograms per liter throughout the contaminated aquifer, and (2) comply with the discharge standards for disposing of the treated water. Progress continues to be made toward the first goal; it is too early to determine if the cleanup standard is economically achievable, but if model predictions are reasonably successful, the aquifer concentrations should approach the cleanup standard in about another decade. The performance record for discharge has been flawed only by one early exceedance caused by a blower malfunction, and two unexplained detections of TCE in the effluent in 1996 (1.9 ug/l on 5/8/96 and 0.77 ug/l on 11/5/96). After the blower malfunction during the start-up phase, the control logic was immediately corrected so that the water pumps will shut down if the blower fails. However, even with the noted detections of TCE in the air stripper effluent, the system discharges have been in compliance with the requirements of the ROD, which for reinjection to the aquifer allowed daily excursions of no greater than 5 ug/l TCE provided that the monthly median was no greater than 0.5 ug/l TCE. In the cases when TCE was detected, the samples two weeks before and afterward had no TCE detected (i.e. <0.5 ug/l) and therefore the discharge standards for reinjection were consistently met.

For the first two years of operation, the air stripper was treating only 45 to 60 percent (120 to 160 gpm) of the design capacity because the injection wells were unable to discharge more. As a result, the Air Force decided to change the discharge from reinjection to surface water discharge. The decision was documented in the Explanation of Significant Difference to the AC&W OU Record of Decision, Discharge of Treated

Groundwater to Mather Lake (AFBCA, 1997a). This allowed the system to treat about 250 gpm. Discharge to the lake has occurred since June 1997 and has met all discharge standards (Montgomery Watson, 1999i).

AFBCA issued a report of proper and successful operation (a.k.a. Operating Properly and Successfully, or OPS) for the AC&W remedial action (AFBCA, 1998d) which received concurrence from USEPA in November 1998 (U.S. EPA, 1998). The OPS report documents that the remedial action is operating as designed, and is successfully remediating the contamination at the site. Based upon system performance to date, the remedial action is expected to require at least another five years to attain the aquifer cleanup standard, and so will require another five-year policy review when the next five-year review for Mather is accomplished.

The remedial action is being maintained in accordance with the Operation and Maintenance Manual for the AC&W (EA, 1995, and Montgomery Watson, 1997e). In 1998 well AT-1 was added as an eighth extraction well to replace AT-3, shut off in 1996 after the aquifer cleanup standard was achieved in its vicinity. When the pump from AT-3 was transferred to AT-1, the discharge pipe was replaced, as it had experienced some apparent corrosion. Also in 1998, the pump discharge pipe in well AT-2 was replaced after its extraction rate was noticed to degrade. It was discovered to have developed holes, apparently caused by galvanic reaction between the black (ductile) iron casing and the stainless steel well screens. As a result of this experience, it is planned for all the pumps to be inspected and the casings replaced in 1999.

The performance monitoring of the AC&W remedial action documents continued success at TCE removal from the aquifer and at meeting discharge standards for the treated groundwater. This demonstrates that the extraction and treatment technologies continue to be effective. Although the concentration of TCE in the influent water has decreased since the extraction rate was increased in mid-1997, the rate of mass removal has remained about the same because the discharge rate has increased.

## **3.2 Groundwater OU Selected Remedies and Remedial Objectives Evaluation (Statutory Level I Review for Northeast Plume)**

### **3.2.1.1 Main Base/SAC Industrial Area Plume Remedial Action**

The remedial action selected in the ROD for the Main Base/SAC Industrial Area Plume is a pump and treat program with the following components:

- a phased implementation program;
- a groundwater extraction, to achieve aquifer cleanup standards, estimated but not limited to a total rate of 1,300 gallons per minute (gpm);



- treatment of the extracted groundwater through air stripping with off-gas treatment (i.e. carbon adsorption) to achieve aquifer cleanup standards (see Table 5) and to achieve discharge standards (for treated water and off-gas);
- groundwater injection in compliance with discharge standards; in combination with other discharge options (to be evaluated during remedial design) that are (a) consistent with attainment of cleanup standards, and (b) cost-effective;
- land-use restrictions will be implemented on USAF property as appropriate, in order to preclude installation of groundwater wells that would not be compatible with protection of public health and the environment; and
- monitoring the groundwater.

In addition, the ROD required the development of a Mather-specific off-base water supply contingency plan, which applies to contaminants from the Main Base/SAC Plume. This plan was finalized in February 1998, and contains requirements for additional sampling of off-base water supply wells near the Main Base/SAC Industrial Area Plume, and for response actions when any contaminants of concern are detected in a supply well at half the cleanup level.

### 3.2.2.2 Main Base/SAC Industrial Area Plume Remedial Objectives Evaluation & Policy Review

The objectives of the remedial action for the Main Base/SAC Industrial Area Plume are to (1) achieve the cleanup standards throughout the contaminated aquifer, and (2) comply with the discharge standards for disposing of the treated water. In addition, the remedial action calls for land-use restrictions on USAF property as appropriate, and groundwater monitoring. The Mather AFB Off-Base Water Supply Contingency Plan (Contingency Plan; AFBCA, February 1998) embodies the objective of preventing water at any drinking water supply well from exceeding the drinking water standard through proactive intervention.

The phased construction of the remedial action is underway; the first phase including the treatment plant and injection wells, has been constructed, and began treating water from 'hot spots' on Mather in April 1998. Phases II and III are currently under construction at the time of this review. A combined draft design report for the two phases was issued in January 1999 (Montgomery Watson, 1999a) and revised in April 1999 (Montgomery Watson, 1999j). Phase II extends the groundwater extraction system off base, and Phase III augments the Phase I system to expand the extent of capture and enhance the capture of 'hot spots' of groundwater contamination. At least one additional phase will be necessary to augment the off-base portion of the extraction system in order to achieve the ROD objectives. Progress toward objective (1) is consistent with the remedial action selected in the ROD. In the first three months of operation, 96 pounds of PCE and 18 pounds of TCE were removed from the groundwater (Montgomery Watson, 1998j).

The effluent from the treatment plant has consistently been non-detect for contaminants of concern, except for one estimated detection of 10 ug/l TPH-g below the laboratory

reporting limit on 5/11/98, as documented in the Third Quarter 1998 Basewide Groundwater Monitoring Report (Montgomery Watson, 1998j) and the 4<sup>th</sup> Quarter and Annual 1998 Groundwater Monitoring Report (Montgomery Watson, 1999i). Thus, the effluent has been in compliance with the discharge standards continuously since the treatment plant started operating.

Land-use restrictions prohibiting or requiring approval for any groundwater well construction on USAF property have been implemented through direct Air Force control prior to property transfer, and through conditions of lease and transfer agreements for all property overlying Groundwater Operable Unit contamination. However, no land-use restrictions have been systematically applied for off-base property. The County of Sacramento is in the process of revising its ordinance governing drilling of wells to incorporate a 'consultation zone' within 2000 feet of any known groundwater contamination that would require consultation with the Regional Water Quality Control Board prior to issuing any well permits. Should this revised ordinance condition become law, it would allow recommendations to the County regarding their permitting choices: to approve, approve with conditions, or deny approval for each permit application. Groundwater monitoring continues as part of the Groundwater Monitoring Program that includes routine monitoring and performance monitoring for the groundwater remedial actions.

The technologies of groundwater extraction, air stripping, and reinjection have been demonstrated to be effective at remediating groundwater contamination. However, the experience at Mather's AC&W Site where reinjection capacity degraded and limited the effectiveness of the remedial action has served as a lesson learned to AFBCA. This experience was carefully considered during the design of the Main Base/SAC reinjection wells. The reinjection was planned in more transmissive aquifer zones, and excess capacity was constructed to allow for possible capacity losses over time. The effectiveness of these technologies will be monitored and documented as part of the annual reporting for the Main Base groundwater remediation.

### 3.2.2.3 Affected Water Supply Wells: Off-base Water Supply Contingency Plan

The ROD also contained a requirement for the Air Force to develop a Mather-specific off-base Water Supply Contingency Plan in consultation with the State, USEPA, and local water agencies. When the ROD was signed in 1995, the Main Base/SAC Industrial Area Groundwater Plume had reached at least one municipal water supply well beyond the base boundary and had the potential to reach other wells beyond the base boundary. Since then, contaminants have been detected at four other supply wells. The levels of contaminant constituents in the affected wells have generally been below the maximum contaminant level (MCL) safe drinking water standards promulgated by USEPA and the State but near the concentrations predicted to represent one-in-a-million cancer risk level to anyone drinking the water for thirty years.

To address the human health threat posed by the Plume to affected water supply wells and wells that may be affected in the future due to plume migration, and to address plume migration as a result of supply wells, the USAF developed a Mather-specific off-base Water Supply Contingency Plan (AFBCA, 1998a) in consultation with the State, USEPA, and local water agencies. The Water Supply Contingency Plan was subject to public review and comment.

The Contingency Plan was required to address the following for each affected well or potentially affected well:

- (1) Determine which wells will likely be affected;
- (2) Provide an ongoing monitoring plan of supply wells and their guard wells, including increased frequency of sampling once a constituent from the Plume has been detected;
- (3) Determine the impact of supply well pumping on the plume and recommend action(s) to minimize plume migration;
- (4) Evaluate the short term and long term options for providing alternate water supplies (the evaluation shall consider the technical effectiveness in dealing with the health threat, implementation time frame, cost, and acceptability to the water purveyor);
- (5) Propose a preferred alternative, including an implementation time schedule, which should address the sequencing of alternate remedies if the final solution is to include short-term and long-term solutions);
- (6) Develop a trigger for ascertaining when an option(s) should be implemented;
- (7) Propose measures and an implementation schedule to mitigate the vertical migration of contaminants to deeper aquifer zones for each well likely to be impacted by the plume; and
- (8) Determine when the monitoring plan can be terminated.

The conditions for triggering the provision of alternate water supply were the subject of dispute resolution among the Air Force, U.S. EPA, and the State of California. The resulting settlement decision established that one half the maximum contaminant level for PCE, TCE, or carbon tetrachloride would be the concentration to trigger initiation of well-head treatment at a well. However, the State disagreed that this trigger was appropriate for PCE, and the settlement also allows any party to reopen the dispute if PCE concentrations are of concern in any supply well or guard well (AFBCA, 1998a).

### 3.2.2.4 Mather Off-base Water Supply Contingency Plan - Remedial Action Objectives Analysis - Policy Review

The objectives of the Contingency Plan were to evaluate the effect of supply wells on contaminant migration, establish action levels for implementing response actions of water treatment or alternate water supply, to assess the options for response actions, and to recommend appropriate response actions.

Two carbon adsorption treatment systems have been installed for off-base water supply wells, consistent with the Contingency Plan, at the well on Moonbeam Drive owned by Citizens Utilities Company of California, and at the Sacramento County water system on Branch Center Drive supplied by the two Juvenile Hall wells. The Contingency Plan requires these treatment units to be operated for a minimum of three years, or until at least November 1, 2000. Influent concentrations for both systems have remained at concentrations that require treatment of alternate water supply under the Contingency Plan. The effluent from both treatment systems has continued to contain no detected contaminants of concern (Montgomery Watson, 1999m).

The Contingency Plan is scheduled for revision in 1999 to reflect changes such as the destruction of the water supply well on Explorer Drive and the transfer of the water system at Mather Air Force Base to Sacramento County.

### 3.2.3.1 Site 7 Groundwater Plume Remedial Action

The remedial action selected in the ROD for the Site 7 Plume is a pump and treat program with the following components:

- groundwater extraction at a rate of approximately 250 gpm;
- treatment of the extracted groundwater through air stripping with off-gas treatment (i.e. carbon adsorption) to achieve aquifer cleanup standards (see Table 5) and to achieve discharge standards (for treated water and off-gas);
- groundwater injection in compliance with discharge standards; in combination with other discharge options (to be evaluated during remedial design) that are (a) consistent with attainment of cleanup standards, and (b) cost-effective;
- land-use restrictions will be implemented on USAF property as appropriate, in order to preclude installation of groundwater wells that would not be compatible with protection of public health and the environment; and
- monitoring the groundwater.

### 3.2.3.2 Site 7 Groundwater Plume Remedial Objectives Evaluation S Policy Review

The objectives of the remedial action for the Site 7 Plume are to (1) achieve the cleanup standards throughout the contaminated aquifer, and (2) comply with the discharge standards for disposing of the treated water.

The construction of the remedial action is underway; the mining of the property overlying the plume has necessitated a staged approach to implementing the Site 7 Groundwater plume remedial action. The treatment plant was constructed in 1998, and began operating to treat groundwater from one existing extraction well in December 1998. This operation will be disrupted for several months in 1999 while mining occurs in the area of this extraction well, after which the extraction system will be reinstalled with at least two extraction wells.

The effluent from the treatment plant has not exceeded the detection limit for contaminants of concern, although the extracted and treated water have greater concentrations of some general minerals than the baseline concentrations measured in the receiving water. General minerals are monitored quarterly, as indicated in the Operations and Maintenance Manual for the Groundwater Extraction and Treatment System for the Site 7 Plume (Montgomery Watson, 1999h). Current plans include making the treated water available to the aggregate mining companies for dust control, thereby reducing the amount of treated water that is injected.

The technologies of groundwater extraction, air stripping, and reinjection have been demonstrated to be effective at remediating groundwater contamination. However, the experience at Mather's AC&W Site where reinjection capacity degraded and limited the effectiveness of the remedial action has served as a lesson learned to AFBCA. This experience was carefully considered during the design of the Site 7 reinjection wells. The reinjection was planned in more transmissive aquifer zones, and excess capacity was constructed to allow for possible capacity losses over time. The effectiveness of these technologies will be monitored and documented as part of the annual reporting for the Site 7 groundwater remediation.

#### 3.2.4.1 Northeast Groundwater Plume Remedial Action

The ROD determined that active remediation of the Northeast Groundwater Plume is not warranted in 1995 because action was being taken to remediate the source (Landfill Site 4), and because removing the low-concentration contaminants from the groundwater would provide little benefit while incurring high costs. The remedial action selected contains the following components:

- Institutional controls (such as deed restrictions) are required to prohibit the installation of groundwater supply wells on Mather AFB that would

jeopardize public health or the environment from the Northeast Groundwater Plume area. If off-base groundwater wells are proposed or constructed that could result in exposure to contaminated groundwater from the Northeast Plume, the need for active cleanup or other action must be revisited. Contaminant concentration levels in the groundwater will be re-evaluated annually. If the contamination concentrations drop below the levels in Table 5 for one year, any institutional controls may be removed.

- Long-term groundwater monitoring will be continued and modified as necessary to monitor contaminant concentrations. Monitoring will be conducted pursuant to Title 23, CCR, Section 2550.10 (Corrective Action Monitoring) for at least one year from the date that the cleanup standards (see Table 5) are attained. After that time, monitoring will, as required by the Landfill ROD, be conducted pursuant to Title 23, CCR, Section 2550.8 (Detection Monitoring), in order to detect potential future releases from Landfill Site 4.
- Prior to the first CERCLA five-year review, additional predictive modeling will be conducted in order to assess whether the contaminants will meet the levels in Table 5 within a reasonable time. The results of that modeling will be published in an appropriate document or an Explanation of Significant Difference (ESD), if necessary. If, at any time monitoring or modeling indicates that the contaminants will not meet the levels in Table 5 within a reasonable time, or at least forty years from the date of the ROD, or that significant migration of the contaminants may occur at levels above those in Table 5 which impacts public health or the environment, active remediation will be reconsidered.

#### 3.2.4.2 Northeast Groundwater Plume Remedial Objectives Analysis S Statutory Review

The remedial action objectives for the Northeast Plume are to protect the public from inadvertent significant exposure to contaminated groundwater by implementing institutional controls, to perform long-term monitoring to maintain an awareness of conditions in the plume and any predictable changes in these conditions, and to reassess the remedial decision if cleanup standards are predicted to require more than forty years to attain.

Institutional controls are in place on Mather AFB via continued Air Force ownership of the property overlying the Northeast Plume, and conditions of the lease agreement with Sacramento County, who now operate the airport. A portion of the Northeast Plume extends beyond the boundaries of Air Force ownership, but concentrations are below cleanup standards at the boundaries.

Mather Groundwater monitoring has occurred in wells throughout the area of the Northeast Plume for three and a half years since the ROD was issued. The character of

the Northeast Plume has not changed radically in this time. Only two of the five COCs have exceeded cleanup standards in this time. Historically, a total of sixteen different wells have had at least one sample where either PCE or cis-1,2-DCE (or both) has exceeded cleanup standards. One well exceeded the cleanup standard for carbon tetrachloride, and one well exceeded the cleanup standard for 1,2 dichloropropane (1,2-DCP). Since the issuance of the ROD, only eight wells have exceeded the cleanup standards. The extent of groundwater with contamination concentrations above the cleanup standard is restricted to an estimated 20% of the total extent of contamination in the Northeast Plume area. Based upon plume interpretations from the Second Quarter 1998 Basewide Monitoring Report (Montgomery Watson, 1998g), approximately 635 acres of Mather AFB are underlain by the Northeast Plume, 128 acres of which exceeds the cleanup standards. The off-base area of the plume beyond the interpreted extent of contamination above the cleanup standard. The northern limit is defined adequately for purposes of remediation, but is not fully defined to the detection limits. Based upon the southerly gradient at the water table near the Northeast Plume that has persisted at least through the 1990's, contamination from sources at Mather (i.e. Landfill sites 3 and 4) is not expected to have migrated very far to the north.

The monitoring well network appears to be adequately distributed throughout the plume area. The contaminant plume is fully defined where it exceeds cleanup standards, and defined to detection limits except for the northern boundary of contamination off base. The eight wells with detections above cleanup standards were evaluated during this five-year review with respect to their useful monitoring life, because the water table has been historically declining. Four of 36 wells monitoring in the Northeast Plume area as of 1992 have since been abandoned, two others had less than four feet of saturated screen during third quarter 1998 water level monitoring, and one was dry. However, none of these six wells has been sampled since before 1993. All of the wells monitored since 1992 are expected to be viable for water level and water chemistry monitoring for at least several years.

The ROD commitment to perform modeling prior to the first five-year review, to predict how much time will be required for the contaminant concentrations to fall below the cleanup standards, has not been accomplished. Inspection of the wells with contaminant detections reveals that the concentrations exhibit sporadic patterns that do not currently allow confident predictions of future concentrations. However, the landfill caps at sites 3 and 4 have only been in place about two and a half years; the Northeast Plume will probably not exhibit measurable changes due to source reduction for a much longer time period.

To satisfy the ROD requirement for predictive modeling of the Northeast Plume, an evaluation will be published by the Air Force in 1999. The evaluation will review the adequacy of current monitoring network, include trend analysis, support the decision to continue monitoring the Northeast plume as opposed to initiating active remediation, and recommend a similar evaluation be conducted periodically as monitoring data warrants, but no less frequently than the five year reviews. Predictive modeling at this time cannot confidently forecast whether the contaminant concentrations will meet the cleanup levels within a reasonable time. Therefore, additional predictive modeling will

be conducted periodically until cleanup standards are satisfied. Changes and trends in the Northeast Plume monitoring results will be evaluated in each Annual Basewide Groundwater Monitoring Report, and the Remedial Project Managers may propose predictive modeling at any time.

### 3.2.5.1 Groundwater OU Performance Evaluations

In addition to operational monitoring of influent and air emissions, the ROD requires that routine sampling of the groundwater will be conducted to monitor the migration of the contaminated plumes and decreases in the concentrations. This data is to be utilized to evaluate the need for institutional controls as well as to periodically evaluate the performance of the remedial system.

Five-Year Site Reviews and periodic performance evaluations, as recommended by USEPA, are to be included as a component of the selected remedy. The specific schedule for periodic performance evaluations will be determined during the remedial design phase. However, USEPA recommends an initial evaluation to be conducted one to two years after the remedy is operational and functional, in order to determine whether modifications to the restoration action are necessary. The USEPA also recommends that more extensive performance evaluations be conducted at least every five years [55 Federal Register (FR) 87401]. The purpose of the evaluations is to determine whether cleanup levels have been, or will be, achieved in the desired time frame. After the evaluations are completed, the following options should be considered:

- discontinue operations;
- upgrade or replace the remedial action to achieve the original remedial action objectives or modified remedial action objectives; and/or
- modify the remedial action objectives and continue remediation, if appropriate [55 FR 8740].

### 3.2.5.2 Performance Evaluations Remedial Objective Analysis

The remedial actions for the Groundwater OU plumes have only recently been initiated. Groundwater monitoring has been ongoing on a regular basis since the first quarter of 1990, and continues with performance monitoring considered in selection of monitoring well locations and sampling frequency (Montgomery Watson, 1998n). However, the remedial action for the Main Base/SAC Plume and the Site 7 Plume have been operating for less than a year (the Main Base/SAC treatment plant began operating in April 1998, and the Site 7 treatment plant began operating in December 1998). Therefore it is too early to observe concentration reductions attributable to the groundwater extraction systems. However, potentiometric observations can be used to evaluate the influence of the Main Base/SAC extraction and injection systems. In keeping with the ROD



requirement, the potentiometric data has been incorporated into the design for ensuing phases of extraction (Montgomery Watson, 1999j). It is proposed that a formal performance evaluation incorporating concentration observations is more appropriate after several years of observations, and should be scheduled prior to the next five-year review.

### 3.3 Soils OU: Selected Remedies and Remedial Objectives Evaluation

#### 3.3.1.1 Site 7/11 - "7100 Area" Disposal Site/Existing Fire Protection Training Area - Selected Remedial Action

The remedial action for Site 7/11 has been selected in the ROD and modified by an Explanation of Significant Differences (AFBCA, 1998c). The major components of this remedy include (ESD modifications shown in *italics*):

- filling in the depression at Site 7 with inert fill *or soils meeting acceptance criteria in the ESD*
- treating the contaminated shallow and deep soils at Sites 7 and 11 by in situ bioremediation and possibly soil vapor extraction (SVE). The in situ bioremediation system could be converted to a SVE system if significant amounts of solvents are encountered, in order to speed up remediation;
- installing a prescriptive landfill cover over the Site 7 impacted area [*the ESD deletes the following ROD condition, "if site conditions indicates it is appropriate, or a vegetative cover if there is no threat to groundwater quality nor generation of landfill gases,"*] using inert soils and/or non-designated soils to construct the foundation for the cap/cover; and
- monitoring the groundwater (if contamination remains in place that threatens groundwater quality).

According to the ROD and ESD, remediation at Site 7/11 will be implemented in a phased approach, whereby SVE, bioventing, and soil gas monitoring will be implemented prior to construction of the [*the ESD deletes the following ROD condition, "a final determination on the need for a"*] prescription landfill cover pursuant to Article 8 of 23 California Code of Regulations (CCR), Division 3, Chapter 15. Once the SVE/bioventing system has been operated until it has met cleanup standards, or design goals as appropriate, or has otherwise reached technical or economic limitations, a determination will be made whether a continuing source of methane or trace gases exist, and whether a significant threat to groundwater quality exists.

The Air Force will conduct further soil gas sampling at this site to define the extent of VOC contamination, as part of the remedial design work. The feasibility of SVE will be evaluated when it is demonstrated that soil contaminants may cause concentrations in the leachate to exceed the aquifer cleanup levels, based on an interpretation of soil gas data using VLEACH or another appropriate vadose zone model.

The ROD contains the following SVE initiation text that applies to Site 7/11, Site 37/39/54, and Site 57:

The actual decision on whether to build and operate an SVE system will depend on the degree to which the contamination presents a threat to ground water and whether site characteristics are suitable for the SVE technology. It is generally preferable from a technical and cost perspective to clean up contamination in the vadose zone before it reaches the ground water. The feasibility analysis will be prepared by the Air Force as a primary document. The decision will be made by the signatory parties to the FFA and will be based, at a minimum, on the following factors:

- a. the cost and time associated with the predicted additional groundwater remediation if no SVE is implemented;
- b. the cost of implementing the SVE system to meet the SVE soil cleanup standard;
- c. the incremental cost over time of vadose zone remediation compared to the incremental cost of groundwater remediation, on the basis of a common unit (e.g., cost to remove a pound of TCE), provided that the underlying groundwater has not reached aquifer cleanup levels;
- d. the results of VLEACH or another appropriate vadose zone model, in conjunction with a groundwater fate and transport model to predict the resulting concentration from the vadose zone contamination in the nearest groundwater wells monitoring the site;
- e. the results of VLEACH or another appropriate vadose zone model, that interprets soilgas data, to predict the mass and concentration of discharges from the vadose zone to the groundwater;

This demonstration is to be made prior to operation of the bioventing system in areas considered for SVE (to prevent interference from bioventing). Once SVE is initiated, it will be terminated in accordance with the demonstration required for Site 57 (ROD Section 2.2.9.7). The need to implement the bioventing remedy will be reevaluated when SVE is terminated.

The ROD contains the following SVE shut-off criteria that apply to sites 7/11, 37/39/54, and 57.

The goal of cleaning up the vadose zone is to minimize further degradation of the groundwater by the contaminants in the soil. It is generally preferable from a technical and cost perspective to clean up contamination in the vadose zone before it reaches the groundwater. The soil cleanup standard will be achieved when the residual vadose zone contaminants will not cause the groundwater cleanup standard, as measured in groundwater wells monitoring the plume, to be exceeded after the cessation of the groundwater remediation. The Air Force will make the demonstration that the standard has been met through contaminant fate and transport modeling, trend analysis, mass balance, and/or other means. This demonstration will include examination of the effects of the residual vadose zone contamination in the groundwater using VLEACH or another appropriate vadose zone model, in conjunction with a groundwater fate and transport model, to predict the resulting concentration from this residual vadose zone contamination in the nearest groundwater wells monitoring the site. This demonstration can be made prior to the cessation of groundwater remediation. The Air Force shall provide verification, through actual data, that the above standard has been met. The signatory parties to this Record of Decision (ROD) will jointly make the decision that the soil cleanup standard has been met.

The Air Force shall operate the SVE system until it makes the demonstration that the cleanup standard, set forth above, has been met. The Air Force shall continue to operate the SVE system if appropriate, after considering the following factors:

- a) Whether the predicted concentration of the leachate from the vadose zone (using VLEACH or another appropriate vadose zone model that interprets soil gas data) will exceed the groundwater cleanup standard;
- b) Whether the mass removal rate is approaching asymptotic levels after temporary shutdown periods and appropriate optimization of the SVE system;
- c) The additional cost of continuing to operate the SVE system at concentrations approaching asymptotic mass levels;
- d) The predicted effectiveness and cost of further enhancements to the SVE system (e.g., additional vapor extraction wells);
- e) Whether the cost of groundwater remediation will be significantly more if the residual vadose zone contamination is not addressed;

(continued)

- f) Whether residual mass in the vadose zone will significantly prolong the time to attain the ground water cleanup standard; and
- g) The incremental cost over time of vadose zone remediation compared to the incremental cost over time for groundwater remediation on the basis of a common unit (e.g., cost of pound of TCE removed) provided that the underlying groundwater has not reached aquifer cleanup levels.

The signatory parties agree that the Air Force may cycle the SVE system on and off in order to optimize the SVE operation and/or to evaluate the factors listed above.

The signatory parties to this ROD will jointly make the decision that the SVE system may be shut off. If the parties cannot reach a joint resolution, any party may invoke dispute resolution. This ROD does not resolve the ARAR status of State requirements regarding the establishment of soil cleanup levels. The parties agree that in the event of a dispute regarding SVE shutoff, the State may argue its authority to require soil cleanup (including soil cleanup standards) as the basis for continuing operation of the SVE system, based on the above factors.

Initial site grading will be accomplished in conjunction with drilling in order to allow site access for the drill rigs; the Site 7 depression may or may not be filled above grade at this time. Further grading may be accomplished to minimize infiltration of surface water into Site 7 during SVE and bioventing. Final site construction will be accomplished at the completion of SVE and bioventing consistent with the cap that is required at Site 7.

### 3.3.1.2 Site 7/11 - Remedial Objectives Evaluation- Policy Review

The remedial objectives for Site 7/11 are to achieve cleanup standards for the COCs, to mitigate any residual source of groundwater contamination that may be present, and to comply with ARARs for the Site 7 solid waste disposal site.

The depression at Site 7 has been filled with soil from other IRP sites to create positive drainage away from the disposal site. In situ treatment and monitoring wells have been installed both within the former waste disposal pit at Site 7 and in the surrounding areas of TPH-d contamination at Site 7/11. Two SVE treatment units were installed at the site. One began operation in November 1998 extracting and thermally treating vapor from Site 11. The second began operating in December 1998 extracting and thermally treating vapor from Site 7. No operating data has yet been reported for either of these SVE systems; the initial data will be used to determine whether there are sufficient volatile

constituents to warrant continuing the in-situ treatment in vapor extraction mode, or whether it should be converted to bioventing mode

Soil vapor extraction technology has been proven effective at Mather AFB, most notably for volatile petroleum constituents at Site 29 and for chlorinated volatile organic compounds at Site 57. Bioventing technology is accepted as a generally effective means of enhancing bioremediation to remediate petroleum products. The effectiveness of bioventing is still being demonstrated at some of Mather's non-CERCLA IRP sites. Respiration tests at these sites indicate that degradation of fuels is occurring, but remedial action has not yet been documented to have achieved cleanup objectives at any of the biovent sites.

### 3.3.2.1 Site 37/39/54 - Building 3389/Hazardous Waste Control Storage S Selected Remedial Action

The remedial action for Site 37/39/54 includes these major components:

- excavating approximately 220 yd<sup>3</sup> of contaminated surface soils to remove all contamination above acceptable levels;
- transporting the excavated soils to the on-base ex situ bioremediation facility;
- treating the excavated soils by ex situ bioremediation as appropriate;
- transporting the treated soils to, and consolidating them with landfill cap foundation materials at Site 7, as appropriate;
- treating the contaminated shallow and deep soils by in situ bioremediation and possible SVE. The in situ bioremediation system could be converted if appropriate, to an SVE system if significant amounts of solvents are encountered in order to speed up remediation; and
- monitoring the groundwater if contamination that threatens groundwater quality remains at the site.

The Air Force will conduct further soil gas sampling at this site to define the extent of VOC contamination, as part of the remedial design work. The feasibility of SVE will be evaluated when it is demonstrated that soil contaminants may cause concentrations in the leachate to exceed the aquifer cleanup levels, based on an interpretation of soil gas data using VLEACH or another appropriate vadose zone model.

The ROD also contains conditions for initiating and terminating SVE remediation at Site 37/39/54 (See text box, Section 3.3.1.1).

### 3.3.2.2 Site 37/39/54 - Building 3389/Hazardous Waste Storage S Remedial Objectives Evaluation S Policy Review

The remedial objectives for Site 37/39/54 are to achieve cleanup standards for the COCs, and to mitigate any potential or residual source of groundwater contamination that may be present

An in situ treatment system of extraction/injection and monitoring wells has been installed at Site 37/39/54 and a soil vapor extraction unit connected to the extraction wells. The treatment unit is still undergoing prove-out; several components required replacement or modification. Consequently, no operating data was available for this review.

The initial soil vapor data will be used to determine whether there are sufficient volatile constituents to warrant continuing the in-situ treatment in vapor extraction mode, or whether it should be converted to bioventing mode

Soil vapor extraction technology has been proven effective at Mather AFB, most notably for volatile petroleum constituents at Site 29 and for chlorinated volatile organic compounds at Site 57. Bioventing technology is accepted as a generally effective means of enhancing bioremediation to remediate petroleum products. The effectiveness of bioventing is still being demonstrated at some of Mather's non-CERCLA IRP sites. Respiration tests at these sites indicate that degradation of fuels is occurring, but remedial action has not yet been documented to have achieved cleanup objectives at any of the biovent sites.

### 3.3.3.1 Site 56 - Oil/Water Separator 2989: Remedial Action

The remedial action selected for Site 56 included the following major components:

- excavating approximately 1,110 yd<sup>3</sup> of contaminated surface and shallow soils to remove all contamination above acceptable levels;
- transporting the excavated soils to the on-base ex situ bioremediation facility;
- treating the excavated soils by ex situ bioremediation as appropriate;
- transporting the treated soils to, and consolidating them with landfill cap foundation materials at Site 4 or Site 7, as appropriate; and
- monitoring the groundwater if contamination that threatens groundwater quality remains at the site.

The oil-water separator and surrounding soil were excavated according to the remedial action selected in the ROD, but some contamination remained in the sidewalls of the

excavation. This meant that further excavation would require building demolition and possibly large amounts of soil removal; both of which were less desirable than in situ treatment. Consequently, the Air Force prepared an Explanation of Significant Difference (IT Corporation, 1998e) to document the selection of additional remedial action to complete the Site 56 cleanup. The additional remedy consists of operating an in situ treatment system to remediate the remaining contamination to meet the cleanup standards.

The remedial system was built in 1998, and a pilot test conducted starting in July to determine if sufficient volatile organic contaminants were recoverable to warrant operation of the system in vapor extraction mode.

The excavation remedy was documented in the Closure Report for Soil Operable Unit Site 65 and Remedial Action Characterization Report for Soil Operable Unit Sites 56, 59, 60, and 62 (Montgomery Watson, 1996). The additional in situ treatment remedy is described in the Technical Information Report for Remedial Action at Sites 56 and 60 (Montgomery Watson, 1998h).

### 3.3.3.2 Site 56 - Oil/Water Separator 2989: Remedial Objectives Evaluation - Policy Review

The remedial objectives for Site 56 are to achieve cleanup standards for the COCs, and to mitigate any potential or residual source of groundwater contamination that may be present

The oil-water separator and surrounding soil were excavated according to the remedial action selected in the ROD, but some contamination remained. As a result, additional remediation by in situ methods was chosen by the Air Force to address the residual contamination, and documented in an Explanation of Significant Difference (AFBCA, 1998e). The original remedial action selected in the ROD was effective at removing the bulk of the contaminated soil.

The excavation remedy was documented in the Closure Report for Soil Operable Unit Site 65 and Remedial Action Characterization Report for Soil Operable Unit Sites 56, 59, 60, and 62 (Montgomery Watson, 1997b). The additional in situ treatment remedy is described in the Draft Technical Information Report for Remedial Action at Sites 56 and 60 (Montgomery Watson, 1999k) and in the Operations and Maintenance Manual and Manufacturers Literature for Soil Vapor Extraction/ Bioventing Systems at Sites 56 and 60 (Montgomery Watson, 1998m).

The in situ treatment system of extraction/injection and monitoring wells was built in 1998, and a pilot test conducted starting in July to determine if sufficient volatile organic contaminants were recoverable to warrant operation of the system in vapor extraction

mode. As a result, the system has been operated in soil vapor extraction mode since then (Montgomery Watson, 1999n).

During monitoring of the soil vapor extraction system, contaminants have been detected that were not identified in the ROD as contaminants of concern. The significance of these additional contaminants will be evaluated prior to terminating the SVE system operation, including their persistence, extent, and presence in nearby groundwater. The narrative standards in the ROD will be applied to any additional contaminants that significantly threaten groundwater quality.

Soil vapor extraction technology has been proven effective at Mather AFB, most notably for volatile petroleum constituents at Site 29 and for chlorinated volatile organic compounds at Site 57. Bioventing technology is accepted as a generally effective means of enhancing bioremediation to remediate petroleum products. The effectiveness of bioventing is still being demonstrated at some of Mather's non-CERCLA IRP sites. Respiration tests at these sites indicate that degradation of fuels is occurring, but remedial action has not yet been documented to have achieved cleanup objectives at any of the biovent sites.

#### 3.3.4.1 Site 57 - Oil/Water Separator 7019: Remedial Action

The remedial action selected for Site 57 included the following major components:

- treating the contaminated shallow and deep soils by in situ SVE; and
- monitoring the groundwater if contamination that threatens groundwater quality remains at the site.

The ROD also contains conditions for initiating and terminating SVE remediation at Site 57 (See text boxes. Section 3.3.1.1).

#### 3.3.4.2 Site 57 – Remedial Action Objectives Evaluation – Policy Review

The remedial objectives for Site 57 are to achieve cleanup standards for the COCs, and to mitigate any residual source of groundwater contamination that may be present

A soil vapor extraction and treatment system was constructed at Site 57 in 1997. A soil vapor extraction system began operating at Site 57 in October 1997. The initial TCE extraction rate was about 20 – 30 pounds per day for the first 75 days of operation, over about six months. Over the first year, the extraction rate tailed off to about 2 pounds per day. As of March 1999, an estimated 3000 pounds of volatile contaminants had been extracted, about 70% of which was TCE.



Additional wells were installed and tested as possible extraction wells in a project called 'Phase II' of the Site 57 remedial action, but these wells proved to be outside the zone of effective vapor removal; consequently they are now used as monitoring wells. The latest information for the remedial action at Site 57 is found in the Informal Technical Information Report for Phase I and Phase II Remedial Action at Site 57 (Montgomery Watson, 1998i). The Operations and Maintenance Manual for the Site 57 Soil Extraction System was issued in 1997 (Montgomery Watson, 1997g)

Soil vapor extraction technology has been proven effective at Site 57, as documented by significant mass removal of TCE from the vadose zone.

### 3.3.5.1 Site 59 - Oil/Water Separator 4251: Remedial Action

The remedial action selected for Site 59 included the following major components:

- excavating approximately 1,200 yd<sup>3</sup> of contaminated shallow soils to remove all contamination above acceptable levels;
- transporting the excavated soils to the on-base ex situ bioremediation facility;
- treating the excavated soils by ex situ bioremediation as appropriate;
- transporting the treated soils to, and consolidating them with landfill cap foundation materials at Site 4 or Site 7, as appropriate; and
- monitoring the groundwater if contamination that threatens groundwater quality remains at the site.

### 3.3.5.2 Site 59 - Oil/Water Separator 4251: Remedial Objectives Evaluation – Policy Review

The remedial objectives for Site 59 are to achieve cleanup standards for the COCs, and to mitigate any potential or residual source of groundwater contamination that may be present

The soil at Site 59 excavated according to the remedial action selected in the ROD, but some contamination remained in the sidewalls of the excavation. Further excavation was not possible without undermining the adjacent aircraft wash rack and possibly requiring large amounts of soil removal; both of which were less desirable than in situ treatment. Consequently, the Air Force prepared an Explanation of Significant Difference (AFBCA, 1998e) to document the selection of additional remedial action to complete the Site 59 cleanup. The additional remedy consists of operating an in situ treatment system (i.e. soil

vapor extraction and/or bioventing) to remediate the remaining contamination to meet the cleanup standards.

The in situ extraction system was installed and pilot tested in 1998; the treatment system is planned for completion and operation in 1999 (Montgomery Watson, 1999f).

### 3.3.6.1 Site 60 - Oil/Water Separator 6900: Remedial Action

The remedial action selected for Site 60 includes the following major components:

- excavating approximately 350 yd<sup>3</sup> of contaminated shallow soils to remove all contamination above acceptable levels;
- transporting the excavated soils to the on-base ex situ bioremediation facility;
- treating the excavated soils by ex situ bioremediation as appropriate;
- transporting the treated soils to, and consolidating them with landfill cap foundation materials at Site 4 or Site 7, as appropriate; and
- monitoring the groundwater if contamination that threatens groundwater quality remains at the site.

### 3.3.6.2 Site 60 - Oil/Water Separator 6900: Remedial Objectives Evaluation – Policy Review

The remedial objectives for Site 60 are to achieve cleanup standards for the COCs, and to mitigate any potential or residual source of groundwater contamination that may be present

The excavation remedy for Site 60 was implemented according to the ROD. However, some contamination remained and additional excavation was not practical due to the depth limitations and the proximity of the adjacent aircraft maintenance hangar. Therefore the Air Force decided to initiate additional remedial action by in situ treatment.

The excavation remedy was documented in the Closure Report for Soil Operable Unit Site 65 and Remedial Action Characterization Report for Soil Operable Unit Sites 56, 59, 60, and 62 (Montgomery Watson, 1997b). The plans for the additional in situ treatment remedy are contained in the Technical Information Report for Remedial Action at Sites 56 and 60 (Montgomery Watson, 1999k). Additional system information is found in the Operations and Maintenance Manual and Manufacturers Literature for Soil Vapor Extraction/Bioventing Systems at Sites 56 and 60 (Montgomery Watson, 1998m).

The in situ treatment system of extraction/injection and monitoring wells was built in 1998, and a pilot test conducted starting in July to determine if sufficient volatile organic contaminants were recoverable to warrant operation of the system in vapor extraction mode. As a result, the system has been operated in soil vapor extraction mode (Montgomery Watson, 1999n).

During monitoring of the soil vapor extraction system, contaminants have been detected that were not identified in the ROD as contaminants of concern. The significance of these additional contaminants will be evaluated prior to terminating the SVE system operation, including their persistence, extent, and presence in nearby groundwater. The narrative standards in the ROD will be applied to any additional contaminants that significantly threaten groundwater quality.

Soil vapor extraction technology has been proven effective at Mather AFB, most notably for volatile petroleum constituents at Site 29 and for chlorinated volatile organic compounds at Site 57. Bioventing technology is accepted as a generally effective means of enhancing bioremediation to remediate petroleum products. The effectiveness of bioventing is still being demonstrated at some of Mather's non-CERCLA IRP sites. Respiration tests at these sites indicate that degradation of fuels is occurring, but remedial action has not yet been documented to have achieved cleanup objectives at any of the biovent sites.

### **3.4 Landfill OU Selected Remedies (Statutory Level I Review for Sites 3 & 4)**

The Landfill OU addresses only remedies related to contamination of the soils at Sites 1 through 6. Any contamination of the groundwater underlying these sites is addressed as part of a separate Groundwater OU ROD.

#### **3.4.1.1 Landfill Site LF-03 – Remedial Action**

The selected remedy for Site 3 is an engineered cap. The major components of this remedy include:

- installing an engineered cap;
- installing passive gas vent wells;
- monitoring of groundwater and landfill gas;
- and invoking access restrictions.

### 3.4.1.2 Landfill Site 3 - Remedial Objectives Evaluation

The remedial objectives of the Site 3 remedial action are to close the landfill in compliance with ARARs, and to thereby protect human health and the environment.

Site 3 was closed and capped successfully in 1996. The site lies in the clear zone at the approach/departure area beyond the northeast end of Mather's runways. The site is fenced, and the site is protected from disturbance by conditions in the lease to Sacramento County. Landfill gas monitoring indicates that the site is in compliance with gas standards, and groundwater monitoring has detected no contaminant plume associated with Site 3.

Post-closure inspections are reported quarterly (Montgomery Watson, 1999c).

### 3.4.2.1 Landfill Site LF-04 – Remedial Action

The selected remedy for Site 4 is an engineered cap and embankment. The major components of this remedy include:

- installing an engineered cap;
- installing flood control measures (e.g., embankment);
- installing passive gas vent wells;
- monitoring of groundwater and landfill gas; and
- invoking access restrictions.

### 3.4.2.2 Landfill Site 4 - Remedial Objectives Evaluation

The remedial objectives of the Site 4 remedial action are to close the landfill in compliance with ARARs, and to thereby protect human health and the environment.

Site 4 was closed and capped successfully in 1996. The site lies beneath the flight path beyond the northeast end of Mather's runways. The site is fenced, and the site is protected from disturbance by conditions in the lease to Sacramento County.

Landfill gas monitoring indicates that the site is not in compliance with gas standards. Corrective measures were implemented in 1998 in the form of a series of gas migration intercept trenches with vent pipes and wind turbines along the northern boundary of Site 4. The methane gas concentrations have decreased from greater than 50% before the trench installation to about 17% as of December 1998; monitoring continues and a contingency plan has been prepared to address additional measures to be taken should the gas concentrations fail to meet the standards in a reasonable amount of time (Montgomery Watson, 1999e). Groundwater monitoring for the required suite of analytes continues; an

organic contaminant plume that apparently originates at Site 4 is being monitored under the remedial action for the Northeast Plume.

Post-closure inspections continue and are reported quarterly (Montgomery Watson, 1999c).

### **3.5 Basewide OU Selected Remedies and Remedial Objectives Evaluations**

#### **3.5.1.1 Sites 10C/68 – Former Fire Department Training Area No. 3 and Fuel Transfer Station – Remedial Action**

The remedial action selected for sites 10C/68, Former Fire Department Training Area No. 3/Two 2,000 Gallon and Sixteen 50,000 Gallon Underground Storage Tanks at Fuel Transfer Station, includes the following major components:

- in situ treatment of the fuel contaminated subsurface soils at Sites 10C and 68; and
- treatment of offgas by granular activated carbon or more cost-effective means of best available control technology as necessary to comply with ARARS.
- monitoring any thermal treatment effluent for dioxins (at least three sampling events during the first month of operation), and conducting a risk assessment if emissions exceed 0.2 nanograms per dry standard cubic meter.

The ROD contains the following SVE initiation text:

The actual decision on whether to build and operate an SVE system will depend on the degree to which the contamination presents a threat to ground water and whether site characteristics are suitable for the SVE technology. It is generally preferable from a technical and cost perspective to clean up contamination in the vadose zone before it reaches the ground water. The feasibility analysis will be prepared by the Air Force as a primary document. The decision will be made by the signatory parties to the FFA and will be based, at a minimum, on the following factors:

- a. the cost and time associated with the predicted additional groundwater remediation if no SVE is implemented;
- b. the cost of implementing the SVE system to meet the SVE soil cleanup standard;
- c. the incremental cost over time of vadose zone remediation compared to the incremental cost of groundwater remediation, on the basis of a common unit (e.g., cost to remove a pound of TCE), provided that the underlying groundwater has not reached aquifer cleanup levels;
- d. the results of VLEACH or another appropriate vadose zone model, in conjunction with a groundwater fate and transport model to predict the resulting concentration from the vadose zone contamination in the nearest groundwater wells monitoring the site;
- e. the results of VLEACH or another appropriate vadose zone model, that interprets soilgas data, to predict the mass and concentration of discharges from the vadose zone to the groundwater;

This demonstration is to be made prior to operation of the bioventing system in areas considered for SVE (to prevent interference from bioventing). Once SVE is initiated, it will be terminated in accordance with the demonstration required for Site 57 (ROD Section 2.2.9.7). The need to implement the bioventing remedy will be reevaluated when SVE is terminated.

SVE termination will be in accordance to the following ROD text that also applies to Site 18 and Site 23:

The goal of cleaning up the vadose zone is to minimize further degradation of the groundwater by the contaminants in the soil. It is generally preferable from a technical and cost perspective to clean up contamination in the vadose zone before it reaches the groundwater. The soil cleanup standard will be achieved when the residual vadose zone contaminants will not cause the groundwater cleanup standard, as measured in groundwater wells monitoring the plume, to be exceeded after the cessation of the groundwater remediation. The Air Force will make the demonstration that the standard has been met through contaminant fate and transport modeling, trend analysis, mass balance, and/or other means. This demonstration will include examination of the effects of the residual vadose zone contamination in the groundwater using VLEACH or another appropriate vadose zone model, in conjunction with a groundwater fate and transport model, to predict the resulting concentration from this residual vadose zone contamination in the nearest groundwater remediation. The Air Force shall provide verification, through actual data, that the above standard has been met. The signatory parties to this Record of Decision (ROD) will jointly make the decision that the soil cleanup standard has been met.

The Air Force shall operate the SVE system until it makes the demonstration that the cleanup standard, set forth above, has been met. The Air Force shall continue to operate the SVE system if appropriate, after considering the following factors:

- Whether the mass removal rate is approaching asymptotic levels after temporary shutdown periods and appropriate optimization of the SVE system;
- The additional cost of continuing to operate SVE system at concentrations approaching asymptotic mass levels;
- Whether the predicted concentration of the leachate from the vadose zone (using VLEACH or another appropriate vadose zone model that interprets soil gas data). will exceed the groundwater cleanup standard,
- The predicted effectiveness and cost of further enhancements to the SVE system (e.g., additional vapor extraction wells);
- Whether the cost of groundwater remediation will be significantly more if the residual vadose zone contamination is not addressed;

- Whether residual mass in the vadose zone will significantly prolong the time to attain the ground water cleanup standard; and
- The incremental cost over time of vadose zone remediation compared to the incremental cost over time for groundwater remediation on the basis of a common unit (e.g., cost of pound of TCE removed) provided that the underlying groundwater has not reached aquifer cleanup levels

The signatory parties agree that the Air Force may cycle the SVE system on and off in order to optimize the SVE operation and/or to evaluate the factors listed above.

The signatory parties to this ROD will jointly make the decision that the SVE system may be shut off. If the parties cannot reach a joint resolution, any party may invoke dispute resolution. This ROD does not resolve the ARAR status of State requirements regarding the establishment of soil cleanup levels. The parties agree that in the event of a dispute regarding SVE shutoff, the State may argue its authority to require soil cleanup (including soil cleanup standards) as the basis for continuing operation of the SVE system, based on the above factors.

### 3.5.1.2 Sites 10C/68 – Remedial Objectives Evaluation – Policy Review

The remedial objectives for Site 10C/68 are to achieve cleanup standards for the COCs, and to mitigate any potential or residual source of groundwater contamination that may be present

An in situ treatment system was installed at Sites 10C/68 in 1997 and operated as a pilot test in soil vapor extraction mode to determine if sufficient volatile organic contaminants were recoverable to warrant operation of the system in vapor extraction mode. The initial soil vapor data indicated very few volatile contaminants were being removed. Consequently the system was then tested in biovent mode. Concern by the RWQCB that some chlorinated volatile contaminants could remain in deep soils at the site resulted in a second SVE pilot test using a water table monitoring well as a test extraction well. The test indicated that SVE using these wells could be productive and also provide aeration of the shallower depths to promote bioremediation. Therefore, the system is being run in SVE mode (Montgomery Watson, 1999n).

During monitoring of the soil vapor extraction system, contaminants have been detected that were not identified in the ROD as contaminants of concern. The significance of these additional contaminants will be evaluated prior to terminating the SVE system



operation, including their persistence, extent, and presence in nearby groundwater. The narrative standards in the ROD will be applied to any additional contaminants that significantly threaten groundwater quality.

Soil vapor extraction technology has been proven effective at Mather AFB, most notably for volatile petroleum constituents at Site 29 and for chlorinated volatile organic compounds at Site 57. Bioventing technology is accepted as a generally effective means of enhancing bioremediation to remediate petroleum products. The effectiveness of bioventing is still being demonstrated at some of Mather's non-CERCLA IRP sites. Respiration tests at these sites indicate that degradation of fuels is occurring, but remedial action has not yet been documented to have achieved cleanup objectives at any of the biovent sites.

### 3.5.2.1 Site 18 – Old Burial Site – Remedial Action

The remedial action selected for Site 18 includes the following major components:

- installing an in situ SVE system comprised of extraction wells and possibly passive injection wells; and
- treatment of offgas by granular activated carbon or more cost-effective means of best available control technology as necessary to comply with ARARS.
- monitoring any thermal treatment effluent for dioxins (at least three sampling events during the first month of operation), and conducting a risk assessment if emissions exceed 0.2 nanograms per dry standard cubic meter.

SVE termination will be in accordance with the text in the text box in the preceding section for Sites 10C/68.

### 3.5.2.2 Site 18 - Remedial Objectives Evaluation – Policy Review

The objective of the remedial action is to reduce the overall cost and duration of the groundwater remedial action by removing contamination from the vadose zone before it enters the underlying groundwater. The remedial action extraction system at Site 18 was constructed in late 1998; the treatment system will be constructed and begin operation in 1999 (Montgomery Watson, 1999f).

Soil vapor extraction technology has been proven effective at Mather AFB, most notably for volatile petroleum constituents at Site 29 and for chlorinated volatile organic compounds at Site 57. Pilot tests at Site 18 have indicated the effectiveness of SVE at this site, at least in the short term, as reported in the Additional Site Characterization Report (IT Corporation, 1996b)

### 3.5.3.1 Site 23 – Sanitary Sewer Line, Main Base Area – Remedial Action

The remedial action selected for Site 23 includes the following major components:

- installing an in situ SVE system comprised of extraction wells and passive injection wells; and
- treatment of offgas by granular activated carbon or more cost-effective means of best available control technology.
- monitoring any thermal treatment effluent for dioxins (at least three sampling events during the first month of operation). and conducting a risk assessment if emissions exceed 0.2 nanograms per dry standard cubic meter.

SVE termination will be in accordance with the text in the text box in the preceding section for Sites 10C/68.

### 3.5.3.2 Site 23 - Remedial Objectives Evaluation – Policy Review

The objective of the remedial action is to reduce the overall cost and duration of the groundwater remedial action by removing contamination from the vadose zone before it enters the underlying groundwater. The remedial action at Site 23 is under construction; some extraction wells have been drilled and the treatment system will be installed in late summer or early fall 1999. System start-up will follow installation (Montgomery Watson, 1999f).

Soil vapor extraction technology has been proven effective at Mather AFB, most notably for volatile petroleum constituents at Site 29 and for chlorinated volatile organic compounds at Site 57.

### 3.5.4.1 Site 87 – Skeet/Trap Range – Remedial Action

The remedial action selected for Site 87 includes of the following major components:

- excavating approximately 28,000 cubic yards of contaminated sediments and surface soils to a 6 inch depth through the fall zone of the lead shot;
- stabilizing (if needed for disposal) approximately 28,000 cubic yards of contaminated sediments and surface soils;

- if any surface water is present, constructing diversion dams to channel the water flow away from the areas to be excavated. These dams would be removed following completion of the excavation activities. If diversion dams are not appropriate, the water will be discharged to the POTW, if approved by Sacramento County;
- transporting the soil, stabilized as necessary, to Site 7 for use as foundation material in construction of a cap, or an off-base facility if sample screening indicates that Site 7 acceptance criteria are not met;
- backfilling the excavated areas with uncontaminated soils and/or recontouring to create effective drainage; and
- institutional controls will be implemented with the goal of protecting human health.

#### 3.5.4.2 Site 87 – Skeet/Trap Range – Remedial Objectives Evaluation, Policy Review (Statutory Review in next Five-Year Review)

The remedial action for Site 87 was implemented in the fall and winter of 1998. The site was successfully excavated, and the excavated material stabilized and transported to Site 7 for incorporation into the foundation for the landfill cap that is to be constructed there. The results of sampling to confirm that the cleanup standards have been met are documented in the Informal Technical Information Report for Remedial Action at Sites 15, 20, 85, 86, and 87 (Montgomery Watson, 1999g). According to this report, the mean lead concentration in the soil after the remedial action is 169.5 mg/kg, and the 90% upper confidence limit estimate of the mean is 226.6 mg/kg, indicating that lead at Site 87 has been cleaned up to well below the cleanup standard of 700mg/kg. As explained below, the site will receive a statutory five-year review as part of the next five-year review report for Mather AFB.

The cleanup standard established in the ROD for lead in soil at Site 87 is 700 parts per million. This concentration, if left in the surface soil, would not allow unrestricted land use. The results of confirmation sampling indicate that parts of the Site 87 area contain lead concentrations above the California screening level of 130 mg/kg, but below the U.S. EPA residential preliminary remediation goal of 400 mg/kg. It is possible that the site is compatible with unrestricted use, but until such a determination is made, the site will require land-use restrictions.

## 4.0 ARARs REVIEW FOR SITES UNDERGOING STATUTORY REVIEW

### 4.1 Landfill OU - Sites 3 and 4

The Applicable or Relevant and Appropriate Regulations (ARARs) cited in the Landfill Operable Unit Record of Decision remain protective of human health and the environment.

The landfill ARARs from titles 14 and 23 of the California Code of Regulations have been revised since the Landfill ROD was issued. These regulations have been combined, revised, and recodified in Title 27 of the California Code of Regulations. Of the affected ARARs, those solely governing the operation of Landfill Site 4 while it was accepting waste consolidated from sites 2, 5, and 6 are no longer applicable to the site, since the site is now closed. Only the ARARs addressing the post-closure status of landfill sites 3 and 4 remain applicable or relevant and appropriate. These are summarized here, with a general Title 27 citation provided for cross-reference. However, the cross-reference may not be an exact equivalent to the ARAR. Some of the sections were reworded or edited, or may have additional content. Consequently the current regulatory citations are not necessarily equivalent to the ARARs, and it is possible that some of the Title 27 citations might not contain ARAR (i.e. substantive) portions of the regulations. As the ARAR citations are the same for both Site 3 and Site 4, this discussion is relevant to both sites.

Table 6: Recodified Post-closure Landfill ARARS – General cross-reference to Title 27

ARARs Citation	Title 27 Citation	Notes
14 CCR 17766 Emergency Response Planning	27 CCR 21130	
14 CCR 17767 Site Security	27 CCR 21135	
14 CCR 17773(b) to (e) Final Cover Design	27 CCR 21140	Potentially relevant to post-closure maintenance
14 CCR 17774((a) & (c) to (h) Construction Quality Assurance	27 CCR 20324	Potentially relevant to post-closure maintenance
14 CCR 17776(a), (c) to (f) Final Grades	27 CCR 21142, 21769	Potentially relevant to post-closure maintenance
14 CCR 17777(a) to (c) Final Site Face	27 CCR 21090, 21142, 21145	Potentially relevant to post-closure maintenance
14 CCR 17778(a) & (c) to (f), Final Drainage	27 CCR 20365, 21150, 21769	Potentially relevant to post-closure maintenance
14 CCR 17779(a) & (c) to (i), Slope Protection and Erosion Control	27 CCR 21090	relevant to post-closure maintenance
14 CCR 17783, Gas Monitoring and Control	27 CCR 20918, 20921 -, 20937,21160	

ARARs Citation	Title 27 Citation	Notes
14 CCR 17788, Post- closure Maintenance	27 CCR 21180(a)	
14 CCR 17796, Post-closure Land Use	27 CCR 21190	
23 CCR 2511 (d), Applicability	27 CCR 20090	
23 CCR 2541 (d), Containment Materials	27 CCR 20320	Potentially relevant to post-closure maintenance
23 CCR 2546(a) & (c) to (f), Drainage Control	27 CCR 20365	
23 CCR Article 5, Groundwater Monitoring	27 CCR 20380 – 20435, 22222	
23 CCR 2580(a), Post- closure Maintenance	27 CCR 20950(a)	
23 CCR 2580(d), Monuments	27 CCR 20950(d)	
23 CCR 2580(e), Vegetation	27 CCR 20950(e)	
23 CCR 2581, Maintenance of Final Cover	27 CCR 21090	
23 CCR 2597, Post-closure Maintenance	27 CCR 21769	

Based upon the continued protectiveness of the ARARs identified in the ROD, and the complexity of mapping the requirements from the ARARs citations to the recodified regulations, it is recommended that no changes to the ARARs citations be made.

## 4.2 Northeast Plume

The ARARs established in the ROD for Groundwater Plumes for the Northeast Plume remain protective of human health and the environment. Exposure to the highest concentration of PCE measured in the Northeast Plume since the ROD, with the assumptions of 30 years of human consumption, is predicted to result in an incremental lifetime cancer risk (ILCR) of 25 in a million, within the acceptable range of 1 to 100 in a million defined in 40 CFR 300 (a.k.a. National Contingency Plan). Thirty-year exposure to groundwater at the highest concentration (10 ug/l PCE) interpreted to extend off base, is estimated to result in an ILCR of about 15 in a million. These risks are within the acceptable range, and there is no current completed exposure pathway.

The remedial action for the Northeast Plume selected in the Groundwater OU ROD included institutional controls to prevent such an exposure pathway from occurring (i.e. limiting new wells or requiring testing if water is intended for human consumption and treatment if groundwater contamination is detected at significant concentrations). The

property overlying the Northeast Plume is still owned by the Air Force, and leased to the County. There are institutional controls within the lease (Lease Agreement between the Department of the Air Force and the Sacramento County Mather Conversion Authority for Mather Air Force Base, California, executed 21 March, 1995, conditions 10, 13, 17.3, 24.1, and 24.2) that prohibit drilling on the leased property without written permission from the Air Force. Condition 20 requires that these requirements bind any sublessee also. Therefore institutional controls are in effect on Air Force property to further ensure that the chance of exposure is minimized, but are not stipulated in the ROD.

No land-use restrictions have been systematically applied for off-base property. However, the County of Sacramento is in the process of revising its ordinance governing drilling of wells to incorporate a 'consultation zone' within 2000 feet of any known groundwater contamination that would require consultation with the Regional Water Quality Control Board prior to issuing any well permits. Should this revised ordinance condition become law, it would allow recommendations to the County regarding their permitting choices: to approve, approve with conditions, or deny approval for each permit application.

The Remedial Project Managers should discuss whether there is a need for amending the ROD for the Groundwater OU to require institutional control to prohibit potential off-base exposures to the groundwater above cleanup standards in the Northeast Plume.

The cleanup standards for the Northeast Plume are listed in Table 6-5 of the ROD, and consist of the federal drinking water primary maximum contaminant levels for 1,2 dichloropropane and tetrachloroethene, as found at 40 CFR 141; the California primary maximum contaminant levels for carbon tetrachloride and cis-1,2-dichloroethene, as found at 22 CCR 66435 64444.5 64473; and the USEPA Suggested No-Adverse-Response Level for Chloromethane, as found in Drinking Water Regulations and Health Advisories, from the Office of Drinking Water. Considered in the determination of cleanup standards are the beneficial uses of the groundwater, established in the Central Valley Region Basin Plan and more specifically in State Water Resources Control Board Resolution 88-63. In addition, subparagraph III G of State Water Resources Control Board Resolution 92-49 is a relevant and appropriate requirement for establishing the cleanup standards.

Portions of 23 CCR 2550 (recodified in Title 27) are relevant and appropriate to the monitoring of the Northeast Plume.

None of the numerical standards used to establish cleanup standards have changed since they were cited in the ROD; therefore, the cleanup standards are still considered protective of human health and the environment. It is concluded that no changes to the ARARs are necessary, and recommended that no changes be made.

## 5.0 SUMMARY OF SITE VISIT

The Air Force Base Conversion Agency has maintained environmental staff and the Air Force Center for Environmental Excellence has maintained a field engineer at Mather Air Force Base since base closure in 1993. Through these personnel as well as contracted professionals and regulatory staff visits, the Air Force has maintained familiarity with environmental remediation activities and site conditions.

For purposes of this review, the latest landfill inspection report (Montgomery Watson, 1999c) fulfills the function of a documented site visit to site 3 and 4. In this report are recorded the conditions of the landfill gas monitoring wells, the caps, and the drainage systems for landfill sites 3 and 4. The Northeast Plume was 'inspected' by an evaluation of the current and predicted functionality of the groundwater monitoring system in use for the Northeast Plume area that includes the groundwater monitoring for landfill sites 3 and 4.

## 6.0 RECOMMENDATIONS - Actions Proposed or Taken

Two concerns have been raised during the course of management of the CERCLA cleanup at Mather that were referred to the five-year review by the remedial project managers from AFBCA, U.S. EPA, the California DTSC and RWQCB. These are the sufficiency of institutional controls in the RODs for Mather Air Force Base, and the consideration of additional contaminants of potential concern at sites where soil vapor extraction is being conducted. For details of the concerns expressed in comments from regulatory agency project managers, and Air Force response to those comments, see appendices A and B.

### 6.1 Institutional Controls

There is a perceived lack of institutional controls required by Mather's RODs for controlling potential exposure to groundwater contaminated at concentrations above the cleanup standards. The ROD for the Groundwater OU does incorporate institutional controls in the selected remedial actions for each of the Groundwater OU plumes, but the ROD contains no details of how the institutional controls are to be implemented. As discussed in Section 3.2, institutional controls are being implemented through Air Force ownership on Mather, and may soon be implemented by Sacramento County for the remainder of the areas impacted by Mather's groundwater contamination. However, these controls are not required by the ROD for the AC&W OU. Although the contamination in the AC&W plume, if unremediated, represents an incremental lifetime cancer risk within the one-in-a-million and one-in-ten-thousand levels, the remedial project managers have agreed to amend the remedial action selected in the AC&W ROD to incorporate similar institutional controls as are required for the Groundwater OU. This can be accomplished in a ROD amendment document or possibly an explanation of significant difference (ESD) from the ROD for the AC&W OU, or in the ROD for the Supplemental Basewide OU. The remedial project managers (RPMs) will consult prior to a decision as to how to implement this amendment. The Air Force will propose an ESD or ROD amendment schedule for the AC&W OU in accordance with the Federal Facilities Agreement (FFA) for Mather AFB, unless the RPMs agree to incorporate this change in the ROD for the Supplemental Basewide OU. If the change is incorporated in an ESD or ROD amendment, the Air Force is currently planning to prepare a draft of the appropriate document by February 15, 2000, subject to the RPMs' decision and approval of a proposal under the FFA.

The Air Force is also implementing institutional controls to protect the remedial actions through leases and deed transfers. However, these controls are not a necessary component of the remedy relied upon to protect human health, and so the RODs will not be amended to incorporate this type of institutional control as required components of the selected remedial actions.



## 6.2 Additional Contaminants of Concern at SVE Sites

Sites 7/11, 37/39/54, 56, 57, and 60 have been selected for in situ treatment in decision documents for the Soil Operable Unit. Site 10C/68 was selected for in situ treatment in the Record of Decision for the Basewide Operable Unit. The in situ treatment at each of these sites has been operated as a soil vapor extraction system (SVE). During SVE system monitoring, chemicals have been detected in addition to those identified as chemicals of concern in the decision documents. The Air Force will treat these chemicals as potential contaminants of concern, and will evaluate any continued presence of these chemicals as part of the decision to terminate SVE at any of these sites.

The potential for additional COCs is present at all SVE sites; the identification of potential COCs will be identified through ongoing monitoring, and presented to the remedial project managers prior to proposed SVE system termination. A tabulation of additional contaminants identified at SVE sites will be prepared by AFBCA and RWQCB project managers in 1999. In addition, additional chemicals detected will be evaluated prior to changing any in situ treatment from SVE to bioventing, in order to be sure the change in treatment method is not incompatible with the presence of the potential COCs. If additional contaminants are identified that are not compatible with the selected remedy of SVE, the BCT will address whether to interrupt the remedial action and whether an Explanation of Significant Differences or ROD amendment is needed to adjust the remedy to be compatible with the additional COC(s).

The significance of these additional contaminants will be evaluated prior to terminating the SVE system operation, including their persistence, extent, and presence in nearby groundwater. The narrative standards in the ROD will be applied to any additional contaminants that significantly threaten groundwater quality.

It is recommended in comments from the Regional Water Quality Control Board that the decision documents be amended to incorporate additional contaminants of concern. It is anticipated that some of these contaminants may be sufficiently removed during the course of remediating the COCs that they are no longer a concern at the time SVE termination is proposed. This would eliminate the need for modifying the governing decision document. If the ROD governing any of these sites is considered for amendment for any other reason, then the opportunity for addressing this concern should also be considered at that time.

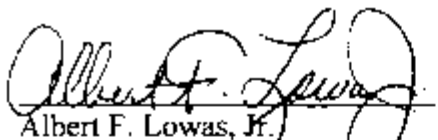
## 6.3 Next Five-Year Review

The next five-year review must be conducted by June 29, 2003. According to the terms of the Federal Facility Agreement for Mather AFB, review of operable units will be conducted every five years counting from the initiation of the first operable unit, until initiation of the final remedial action for the Site. At that time a separate review for all operable units shall be conducted. Review of the final remedial action (including all operable units) shall be conducted every five years, thereafter. This would indicate the

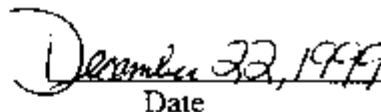
next review date within 15 months after the Supplemental Basewide OU ROD, or sometime in 2001 based upon current schedules for the last operable unit. The date may be adjusted to be as late as June 29, 2003, by consensus of the signatory parties to the Federal Facility Agreement for Mather AFB.

## 7.0 STATEMENT ON PROTECTIVENESS

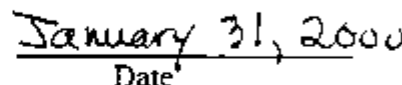
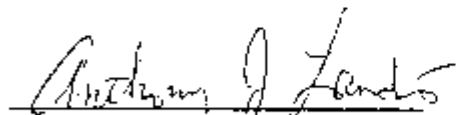
Based on the information provided in this Five-Year Review Report, it is determined that the remedial actions selected and implemented for environmental contamination at sites at Mather AFB, and for groundwater contaminated by historical activities at Mather AFB, are functioning as designed, and are protective of human health and the environment. It is further determined that all necessary operations and maintenance are being performed.




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Date

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Department of Toxic Substances Control  
California Environmental Protection Agency

  
Date

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- Montgomery Watson, 1999m, Off-base Wellhead Treatment System Sampling at Moonbeam and Juvenile Hall, May 1999
- Montgomery Watson, 1999n, Soil Vapor Extraction/ Bioventing Quarterly Monitoring Report, Sites: 7, 10C/68, 11, 18, 19, 23, 29, 34, 35/36, 37/39/54, 56, 57, 59, 60, 2595, 18015, First Quarter 1999, May 1999
- Roy F. Weston, Inc., 1986, Installation Restoration Program (IRP) Phase II, Stage 1 Investigation
- USAF, 1989, Interagency Agreement for Mather Air Force Base, dated July 1989
- U.S. EPA, 1991, Structure and Components of Five-Year Reviews, OSWER Directive 9355.7-02

U.S. EPA, 1994, Supplemental Five-Year Review Guidance, OSWER Directive  
9355.7-02A

U.S. EPA, 1995, Second Supplemental Five-Year Review Guidance, OSWER Directive  
9355.7 - 03A

U.S. EPA, 1998, Memorandum from Daniel D. Opalski, Chief, Federal Facilities Cleanup  
Branch, U.S. EPA, Region IX, to Anthony Wong, BRAC Environmental Coordinator,  
AFBCA, Mather, CA, November 25, 1998

## **Appendix A:**

### **Response to Comments on Draft Mather Five-Year Review**

#### **United States Environmental Protection Agency**

##### **U.S. EPA General Comment 1:**

The first recommendation of this review is an amendment of the Records of Decision (RODs) for the AC&W and Groundwater OUs to include institutional controls that would control potential exposure to contaminated groundwater. As elaborated in the specific comments below, the Groundwater OU ROD already contains such institutional controls. However, the AC&W OU ROD did not include institutional controls and this ROD should be amended to include institutional controls that prevent potential exposure to contaminated groundwater as part of the remedial action.

**Response:** Comment accepted. The text has been modified to reflect this comment.

##### **U.S. EPA General Comment 2:**

The second recommendation concerns sites where additional volatile organic contaminants are detected during soil vapor extraction, but these contaminants were not identified as COCs for the site in the ROD, and consequently do not have site-specific cleanup standards. The Air Force recommends that an evaluation of any volatile non-COCs that have been detected in significant concentrations during the operation of soil vapor extraction remedial action be evaluated and addressed prior or during any consideration of SVE termination. This recommendation is based on the presumption that these contaminants may be sufficiently removed during the course of remediation of the COCs that they are no longer a concern when SVE termination is proposed. We concur with this recommendation with the following conditions: the potential COCs in question have cleanup standards (although for other sites) in the ROD and these cleanup standards will be adhered to for any new COC identified at the site; SVE/bioventing is an appropriate remedy for the potential COCs in question; and, prior to closure, the Air Force provides the regulators with information on the new potential COCs for each site and how they will be evaluated during site closure. The sites where new potential COCs have been detected to date should be identified, along with the potential COC, in this 5-year review.

**Response:** Sites 7/11, 37/39/54, 56, 57, and 60 have been selected for in situ treatment in decision documents for the Soil Operable Unit. Site 10C/68 was selected for in situ treatment in the Record of Decision for the Basewide Operable Unit. The in situ treatment at each of these sites has been operated as a soil vapor extraction system (SVE). During SVE system monitoring, chemicals have been detected in addition to those identified as chemicals of concern in the decision documents. The Air Force will treat these chemicals as potential contaminants of concern, and will evaluate any continued presence of these chemicals as part of the decision to terminate SVE at any of these sites.

The potential for additional COCs is present at all SVE sites; the identification of potential COCs will be identified through ongoing monitoring, and presented to the remedial project managers prior to proposed SVE system termination.

**U.S. EPA Specific Comment 1:** Page 1-2, Section 1.2.1 - The EPA remedial action start date for the AC&W site is June 30, 1994.

**Response:** Comment noted. The driller's log for the first injection well drilled at the AC&W indicates a start of construction on 29 June. This date will be used; it is very close to the start date used by U.S. EPA and results in a report deadline that meets the deadline calculated using the EPA remedial action start date of 30 June.

**U.S. EPA Specific Comment 2:** Page 1-3, Section 1.3, first paragraph - The text should state the next 5-year review for site 87, and, potentially site 89, will be a **Statutory** Type 1 review.

**Response:** Comment accepted. The text has been modified to address this comment.

**U.S. EPA Specific Comment 3:** Page 1-8, Table 1, Site 69 - Please state what the remedial action is at this site and what type of review was conducted.

**Response:** Comment accepted. The text has been modified to address this comment.

**U.S. EPA Specific Comment 4:** Page 1 - 10, Table 1, Site 86 - Please state what type of review was conducted for this site.

**Response:** Comment accepted. The text has been modified to address this comment.

**U.S. EPA Specific Comment 5:** Page 2-1, last sentence - The sentence states that there has been no CERCLA enforcement actions at the Soil OU sites or the Groundwater OU plumes. Please indicate whether there has been CERCLA enforcement actions at any of the OU sites.

**Response:** Comment accepted. The text has been modified to address this comment.

**U.S. EPA Specific Comment 6:** Page 2-5, last sentence - The Table referred to in this sentence should be Table 5, not Table 2. This error is repeated throughout the document.

**Response:** Comment accepted. The text has been modified to correct this error.

**U.S. EPA Specific Comment 7:** Page 2-7, second paragraph - The text should describe the remedial action selected for the NBA plume in the Groundwater OU ROD, essentially institutional controls with groundwater monitoring, and explain that the presumed source areas for the plume, IRP 4 and 5, have been capped. Also, in the explanation of why a statutory review will be conducted, it should be indicated that due to the length of time for cleanup standards to be achieved, for all intent and purposes, unrestricted use of the

groundwater and land overlying the plume will not be possible for an extended period of time.

**Response:** Comment accepted. The text has been expanded to explain that the selected remedial action for the Northeast Plume is monitoring and institutional controls; that the presumed source of the plume, the IRP Site 4 landfill, has been capped; and that the contamination concentrations are expected to require more than five years to diminish to achieve the cleanup standards.

**U.S. EPA Specific Comment 8:** Page 2-15, Section 2.4.11 - The first paragraph should state where the cleanup standards established in the ROD may be found (Table 5). Additionally a sentence should be added to the end of this paragraph that indicates cleanup levels were achieved and therefore no 5-year review is necessary.

**Response:** Comment accepted. The text has been modified to address these omissions.

**U.S. EPA Specific Comment 9:** Page 2-22, Section 2.6.4 - Please indicate that the cleanup standards for Site 86 allow for unrestricted land use and specify whether the Draft Closure Report indicates that the cleanup levels were attained.

**Response:** Comment accepted. The text has been modified to address this comment.

**U.S. EPA Specific Comment 10:** Page 2-23 Section 2.7.1, 2.7.3, and 2.7.4 - Since a decision in a ROD has not yet been made on the remedial action or cleanup levels for these sites, the last two sentences in both these sections should be deleted.

**Response:** Comment accepted. The text has been modified to reflect the remedial decision status of the Supplemental Basewide Operable Unit sites.

**U.S. EPA Specific Comment 11:** Page 2-23, Section 2.7.2 - This section does not contain sufficient information on Site 85.

**Response:** Comment accepted. The text has been modified to address this comment.

**U.S. EPA Specific Comment 12:** Page 2-24, second paragraph, last sentence - Please indicate the years the Technical Review Committee met.

**Response:** Comment accepted. The text has been expanded to address this comment.

**U.S. EPA Specific Comment 13:** Page 3-9, last paragraph, first sentence - This sentence states that land use restrictions prohibiting or requiring approval for any groundwater well construction were not required in the Groundwater OU ROD. This is inconsistent with the ROD and the previous page of this document indicates such a land use restriction was part of the selected remedy. Also, the last sentence of this paragraph is awkward and should be rewritten

**Response:** The wording has been changed to avoid misunderstanding. The wording “Although not required in the ROD” was intended to describe the conditional nature of the ROD requirement, that land-use restrictions would be implemented as appropriate, and was not intended to be inconsistent with the commitment in the ROD.

**U.S. EPA Specific Comment 14:** Page 3-14, third full paragraph, first sentence - This sentence states that the monitoring well network is adequately distributed throughout the plume area, with the exception of the northern boundary of contamination off-base. If the monitoring network is inadequate, then does the Air Force plan to install additional monitoring wells along the northern edge of the plume? If not, please explain why.

**Response:** The text has been revised to distinguish between adequate distribution of monitoring wells and definition of the plume boundary. The monitoring well network adequately defines the extent of contamination to the cleanup standards, but the northern boundary of the plume is not fully defined to the detection limit.

**U.S. EPA Specific Comment 15:** Page 3-14, last paragraph - The text indicates that the ROD commitment to perform modeling of the NBA plume to predict the time required for the contaminant concentrations to fall below the cleanup standards has not been performed. This missed commitment is attributed to the concentrations to date exhibiting sporadic patterns that do not allow confident predictions and, the landfill caps at Sites 3 and 4 having only been in place for two years, which is inadequate time for groundwater changes due to source control. Although we agree that modeling with the current data may not provide meaningful information, we expect the Air Force to conduct this modeling at some time in the future. The Air Force should indicate in this document the time frame for conducting this modeling.

**Response:** A memorandum evaluating the groundwater monitoring data from the northeast plume will be issued under separate cover to satisfy the ROD commitment for modeling. The analysis will not include groundwater flow nor contaminant transport computer modeling but will be adequate to support the decision to continue groundwater monitoring as opposed to initiating active remediation.

**U.S. EPA Specific Comment 16:** Page 4-1, Section 4.1 - Unless there are new ARARs that question the protectiveness of the remedy, Title 27 does not need to be cited (i.e., Table 6 is unnecessary).

**Response:** Comment noted. The table will be left in as an information item.

**U.S. EPA Specific Comment 17:** Page 4-2, last paragraph, first sentence - See comment number 12.

**Response:** The text has been corrected to reflect the institutional control language from the Groundwater OU ROD, in accord with EPA comment #13.

**U.S. EPA Specific Comment 18:** Page 4-3, second full-paragraph - Although we encourage the Air Force to work with local agencies to the maximum extent possible to establish restrictions off-base that prevent exposure to contaminated groundwater, we are unclear on the type of institutional controls the Air Force could institute on off-base property since this area is generally beyond the Air Force's direct control.

**Response:** This is acknowledged. However, with cooperation of the permitting agency, the Air Force and the Regional Water Quality Control Board will be consulted during review of well permit applications in or near the Mather groundwater contamination plumes.

**U.S. EPA Specific Comment 19:** Page 6-1, last paragraph - The proposed date for the next five-year review is June 21, 2003. This date is presumably based on initiation of the final remedial action, as required by the Federal Facilities Agreement (FFA). EPA recommends, based on OSWER Directive 9355.7-02, that all future 5-year reviews occur every five years after completion of the first five year review. Based on this recommendation, the next review would be due June 30, 2004.

**Response:** The text has been modified to propose that the next five year review be conducted five years after the current review. As this is different than the Federal Facility Agreement, adjusting the schedule would require a consensus statement under the FFA.

## **California Department of Toxic Substances Control**

### **DTSC general comment:**

The Department of Toxic Substances Control (DTSC) has received the subject document dated February 9, 1999. The five-year review is required under the Comprehensive Environmental Response, cleanup (sic), and Liability Act (CERCLA) Section 121(c). The purpose of the review is to determine if the remedial action selected under the Record of Decision (ROD) is still protective of human health and the environment and to make recommendations to attain or maintain protectiveness. The first ROD for Mather was signed in June 1994 for the Aircraft Control and Warning (AC&W) Operable Unit (OU). As per the Federal Facility Agreement, this five-year review looks at the AC&W remedial action, but also all other remedial actions selected for all additional OU. DTSC has reviewed the document and finds that the format and information is fairly complete and comprehensive. Most of our comments are minor.

**Response:** Comment noted.

**DTSC comment #1:** The document did not contain Figure 2.

**Response:** Figure 2 has been included in the revised report.

**DTSC comment #2:** Throughout Sections 2 and 3, the cleanup standards are referenced as being in Table 2. It appears the correct reference should be to Table 5.

**Response:** These references have been corrected.

**DTSC comment #3:** Page 2-6, Section 2.3. 1. Groundwater modeling has indicated that it will take at least thirty years to reach the cleanup standards. Therefore, wouldn't it be more accurate to say the remedial action will take *more than five years* rather than to say *at least five year*?

**Response:** Comment accepted; the text has been revised accordingly.

**DTSC comment #4:** Page 2-8, Section 2.4.1. The last sentence in the first full paragraph does not make sense. Perhaps a word is missing.

**Response:** The text has been revised to clarify the intended meaning.

**DTSC comment #5:** In Section 2, for those sites awaiting closure approval (15, 20, 69, 2, 5, 86, 80, and 88) it might be more accurate to finish the section with the following statement, If the closure report is accepted, no five-year review is required for Site xx.

**Response:** Comment accepted; the text has been revised accordingly.

**DTSC comment #6:** Page 2-12, Section 2.4.6. The section should mention that there is an Operations and Maintenance Manual completed for Site 56 and again in Section 2.4.9, for Site 60.

**Response:** Comment accepted; the text has been revised accordingly.

**DTSC comment #7:** Page 2-17, Section 2.5. 1. A Figure 1.1 is mention. This is probably a typographical error.

**Response:** The reference has been corrected; it now refers to Figure 1.

**DTSC comment #8:** Page 2-20, Section 2.6. The introductory paragraph should mention that if Site 86 achieves the cleanup standard, no five-year review will be necessary. The first sentence mentions six sites, but only discusses five of the sites. It makes the paragraph more complete to add Site 86.

**Response:** Comment accepted; the text has been revised accordingly.

**DTSC comment #9:** Page 2-22, Section 2.6.4. The first paragraph is missing some words.

**Response:** Comment accepted; the text has been revised accordingly.



**DTSC comment #10:** Page 2-23, Section 2.7.2 This Paragraph should contain information on the Removal Action Memorandum and discuss the work that has already been accomplished.

**Response:** Comment accepted; the text has been revised accordingly.

**DTSC comment #11:** Section 3, Table 5. The contaminant of concern (COC) column indicates that surface soil COCs are from the Basewide Operable Unit. It would be helpful to indicate which OU the surface soil and subsurface soil levels can be found.

**Response:** Comment accepted; the table entry for Site 20 has been revised accordingly.

**DTSC comment #12:** Page 3-7, Section 3.1.2. The discussion on the AC&W plume includes information on discharge requirements to the aquifer. Since the discharge is now to Mather Lake, the paragraph should indicate if those discharge requirements have changed and also mention if there have been any exceedances of those levels.

**Response:** Comment accepted; the second paragraph of Section 3.1.2 has been revised to address the comment.

**DTSC comment #13:** Page 3-8, Section 3.1.2. Please review the sentence in the paragraph at the top of the page that discusses the discharge pipe for well AT-2. There is an incomplete sentence. The last paragraph for this section indicates that while contaminant concentrations have decreased, the mass removal has remained the same. Does that indicate a need to reevaluate the original mass calculations or is there some other action that is needed?

**Response:** The words “was replaced” have been added to the sentence. The relationship of concentration to volume pumped or mass removed does not indicate a need to reevaluate the original mass calculations; it indicates that the increased pumping of the extraction wells is not resulting in an increased mass removal rate. This may reflect both cleaner water being extracted (hence the lower concentrations), but also an offset of the expected decline in mass removal rate at a given extraction rate by the increased extraction rate.

**DTSC comment #14:** Page 3-8, Section 3.2.1.1. The third bullet under the remedial action for the pump and treat program needs to be rewritten. As currently written, it reads as though the treatment of the off-gas will achieve aquifer cleanup standards. Actually, treating the off-gas helps achieve air ARARs. The text probably should state that treatment of extracted groundwater through air-stripping achieves the aquifer cleanup standard using off-gas treatment options. This same comment applies to Section 3.2.3.1, page 3-12.

**Response:** Comment noted. The wording was verbatim from the ROD; however, the text has been revised to provide clarification as requested by the comment.

**DTSC comment #15:** Sections 3.2.3.1 and 3.2.3.2 need to have the phrase Main Base/SAC industrial area plume removed and replaced with Site 7 plume.

**Response:** Comment accepted; the text has been revised to correct this error.

**DTSC comment #16:** Page 3-12, Section 3.2.3.2, second paragraph. Based on comments received during the review of the Phase II/III reports, it was agreed by the BCT that the work at Site 7 would be referred to as “staged” rather than “phased.” This will avoid confusion with the Main Base/SAC plume work. The last paragraph on the page should perhaps contain a brief sentence on the problem with general mineral levels in the injection wells.

**Response:** Comment accepted; the text has been revised to address the comment.

**DTSC comment #17:** Page 3-13, Section 3.2.4.1. Please correct all the references to Table 5-10, which does not appear in this document. On page 3-14, the end of the second fall paragraph, the words sources and Mather need to be reversed. The last paragraph needs to indicated whether the AF will commit to doing groundwater modeling on the Northeast plume in the future as required in the ROD.

**Response:** The text will be modified to refer to Table 5 of the Five-Year Review Report rather than Table 5-10 of the ROD.

**DTSC comment #18:** Page 3-25, Section 3.3.6.2. There is initial data for Sites 56 and 60 to indicate that soil vapor extraction needs to continue. A meeting was held in December with the regulators and AF contractors to discuss that issue.

**Response:** Comment noted; the text has been revised to update the current status of sites 56 and 60.

## **California Regional Water Quality Control Board, Central Valley Region**

### **RWQCB general comment:**

We have reviewed the *Draft Five-Year Review of Remedial Actions Under CERCLA* (Draft Review), submitted 9 February 1999. According to the *Second Supplemental Five-Year Review Guidance* (OSWER Directive 9355.7-03A, 21 December 1995), “*The most important determination which should result from a five-year review is whether the remedy remains protective of human health and the environment. Other findings necessary in a five-year review concern whether the remedy is functioning as designed, and whether necessary operation and maintenance is being performed Those findings should be documented in the review, and should be the subject of recommendations, as appropriate.*” In General, the Draft Review fulfills these goals. However, we have concerns with the recommendations presented in the Draft Review with respect to institutional controls and addressing new contaminants of concern (COCs). The Draft

Review also contains many editorial errors, which we prefer to discuss at an informal meeting with the Air Force at the earliest convenience. Our Major and Specific comments are presented below.

**Response:** Specific comments are addressed below. The document has been revised to correct editorial errors.

**RWQCB comment #1:**

**Institutional Controls**, Section 6.1, page 6-1, second paragraph: A major issue identified in the Draft Review is the lack of institutional controls required by Mather's Record of Decisions (RODs). The Groundwater ROD includes the general statement, "land-use restrictions will be implemented on Air Force property as appropriate, in order to preclude installation of groundwater wells that would not be compatible with protection of public health and the environment. This general statement does not address: protection of the groundwater treatment systems; prohibit construction of new wells or recharge basins; address the effects of pumping existing supply wells; type of legal instrument, involved parties, enforceability by the State, or a timeline and process for implementing institutional controls. In addition, the Landfill, AC&W. Soils, and Basewide RODs do not stipulate specific institutional controls either.

We agree with the Draft Review's recommendation that the decision to amend the RODs to include institutional controls be incorporated into the Final Review. Section 6.1 should be revised to document the Air Force commitment to prepare ROD Amendments to address these issues and include an agreement reached by the BCT on the timing and preparation of these ROD Amendments. A schedule for preparing the ROD Amendments is critical for our budget planning for the upcoming fiscal year (i.e., FY 1999/2000).

We believe that the institutional control portions of the RODs should specifically address the following items:

- 1) **Legal Instrument.** Implementation of Controls should be linked to a specific legal instrument, such as a covenant or recorded deed restriction. The ROD should specify which legal instruments will be used to implement each of the Controls for a site.
- 2) **Involved Parties.** The ROD should specify which parties need to be involved for each Control at a site. In theory, involved parties for a Control at a site may include the Air Force, USEPA, DTSC, the Regional Board, the County, the new property owners, etc. It is probable that not all parties need to be involved in all the Controls that may be implemented.
- 3) **Enforceability by the State.** Institutional controls should also be enforceable by the State, since the ROD is enforceable. The State should be able to enforce the Controls to assure that the remedy is properly implemented and protected after its implementation.

4) **Timeline.** The ROD should identify a timeline for implementing Controls at sites where they are necessary. This timeline can be either date-specific, in which identification and implementation of Controls are tied to calendar dates, or actionspecific, in which the identification and implementation of Controls within a certain timeframe are tied to the specific actions at a site, such as the beginning or completion of a remedial action.

5) **Process.** The ROD should identify the primary document which will address the process that will be used to identify, describe and implement the specific Controls at sites where they are required.

The revision to the County of Sacramento ordinance to incorporate a ‘consultation zone’ into the well permitting process will provide a much greater degree of confidence that public health will be protected from groundwater contamination and that Mather’s groundwater remedy will be protected. The ordinance revisions are expected to be adopted later this summer. Until the consultation zone was developed, implementing institutional controls for off-base property where new wells could affect groundwater contamination was problematic and difficult to monitor.

**Response:** The text has been modified to include specific recommendations with respect to institutional controls, which are described as components of the remedial action relied upon to protect public health and the environment, or otherwise required as Applicable or Relevant and Appropriate Requirements. Other land-use restrictions may be implemented in order to protect the remedial systems, but are not directly relied upon for protection of public health or the environment.

AFBCA is in the process of developing guidance for institutional controls and land-use controls that calls for a ‘layering strategy’ to identify how the combination of engineering and administrative controls combine to provide protection of human health and the environment, as well as protection for the remedial systems. A strategy/implementation plan is a more appropriate document in which to identify details of institutional controls required by the RODs and those not required to protect human health and the environment, but implemented to protect the remedial systems.

## **RWQCB comment #2:**

**Additional COCs,** Section 6.1, page 6-1, third paragraph: A second major issue identified in the Draft Review is identification and cleanup of additional COCs that are detected during soil vapor extraction (SVE), and are not identified as COCs in a ROD. The Air Force recommends an evaluation of any “non-COC” volatile organic compounds (VOCs) that have been detected in significant concentrations, during the operation of SVE remedial action, be evaluated and addressed prior or during any consideration of SVE termination.

We have concerns with the Draft Review’s recommendation for putting off evaluation of new COCs until consideration of soil vapor extraction (SVE) termination. We believe it is appropriate to document new COCs, establish cleanup objectives, and determine that

the selected remedy and its design are appropriate to meet those objectives. In addition, if the ROD does not contain a cleanup objective for these new COCs, there is no requirement for the Air Force to achieve a certain level of cleanup prior to ceasing operation of the remedy. We believe that evaluation of new COCs should, be done concurrent with the institutional control evaluation so that any newly identified COCs can be documented in the ROD Amendments. Documenting new COCs now may prevent the need to prepare additional ROD Amendments in the future, if the institutional control ROD Amendments proceed termination of SVE. Such a ROD Amendment would also document the Air Force Commitment to adhere to cleanup standards for other sites, as EPA recommends.

At Basewide OU ROD Site 10C/68, a SVE pilot study was conducted concurrent with preparation of the Basewide ROD. The presence of VOCs in the deep soils was confirmed by vapor monitoring probes installed as part of the SVE pilot study. This information was not available during preparation of the feasibility study. Therefore, for Site 10C/68, the selected remedy of SVE only targeted COCs (identified in the Basewide OU ROD as BTEX, TPH-diesel, TPH-gasoline, and carbon tetrachloride) in the shallow soils. No deep vapor extraction wells have been installed to specifically address the deep VOC contamination. Since the deep VOCs have not been evaluated as potential COCs, there is currently no ROD requiring cleanup of these contaminants, and the current selected remedy (shallow SVE) will not cleanup the deep VOC contamination. Furthermore, the Air Force has already switched this site over to the bioventing mode for the shallow soil contamination. This action could potentially mobilize VOC contamination into surrounding areas.

We do not concur with the termination of SVE at Site 10C/68. To address our concerns, the Air Force agreed to convert two existing water table monitoring wells into vapor extraction wells and conduct a short SVE pilot study to evaluate the concentrations of VOCs in the deep soils. The pilot study has been conducted and the results currently being prepared. Other sites where new VOCs have been detected are Sites 7/11, 37/39/54, 56, 57, and 60. Sites with multiple source areas such as Sites 10C/68, 7/11, and 37/39/54 are most likely to have new VOCs that will not be cleaned up unless the remedy is specifically targeted to achieve their cleanup.

We believe that an evaluation of these sites and a screening of new COCs could be accomplished in a letter report, which then would provide the basis for a ROD Amendment. The Board has provided the Air Force with the data from an initial VLEACH modeling effort to evaluate VOCs detected at Sites 10C/68, 56, and 60. The results of this effort have not been fully evaluated by the Board or the Air Force to date. This information may be useful as a first step in evaluating if the additional VOCs are new COCs at these sites.

Other concerns for not addressing new COCs now include: 1) Funding, contracting support, and technical staff to address new COCs during SVE termination or site closure will decline, therefore, making future program adjustments difficult and time consuming. 2) SVE systems that are designed to address petroleum contamination and not VOCs may

need to be modified to achieve total cleanup (e.g., 10C/68). If the need to modify these systems is not identified until termination of SVE is proposed, site closure may be significantly delayed and be unnecessarily costly.

The Draft Review should be revised to identify sites where new VOCs have been detected, and document a course of action (i.e., COC Screening Evaluation Letter Report and ROD Amendments) and a schedule for identifying if the additional VOCs are new COCs.

**Response:** The text has been modified to reflect the fact that all the in situ treatment systems at all sites with additional contaminants of potential concern are currently being operated in vapor extraction mode. Section 6 has been revised to identify that all SVE sites are subject to review for additional contaminants of potential concern.

**RWQCB comment #3:**

Section 3.2.2.2, page 3-9, second paragraph: This paragraph should state that additional phases beyond the combined Phase II/III will be necessary to achieve ROD objectives, and include a schedule for implementing additional phases.

**Response:** The text has been revised to address the relationship of Phase II/III to the overall ROD objectives.

**RWQCB comment #4:**

Section 3.2.2.4, page 3-11: This section should specify which off-base water supply wells have treatment systems (i.e., Moonbeam well and Juvenile Hall wells), and be expanded to describe the contamination detected to date in the Mars well. This section should state that the Contingency Plan will be revised this year, and that the impacted Explorer supply well was permanently destroyed in October 1998.

**Response:** The text has been revised to include a summary of the information requested.

**RWQCB comment #5:**

Section 3.2.4.2, page 3-14: The previous section list a ROD requirement for predictive modeling to be conducted on the Northeast plume prior to the first CERCLA five-year review. This modeling has not been performed to date. The Review should state when this modeling will be conducted. We request that this modeling effort include an evaluation of potential impacts to the existing Mather water supply wells which are down gradient of the Northeast plume. The modeling should include scenarios that assume that all four Mather supply wells are pumping at capacity to determine if operation of these wells will adversely affect the Northeast plume or the Main Base/SAC groundwater plume treatment system.

**Response:** The text has been revised to state that a predictive evaluation will be conducted for the Northeast Plume in 1999 to satisfy the ROD requirement.

**Sandra Lunceford** (comments submitted as member of public)

**Sandra Lunceford comment #1:** Have all cleanup standards for surface soil at Site 56 been met, and if not what is planned?

**Response:** One surface soil sample collected from the north side of Site 56 after excavation had detectable concentrations above the cleanup standards for oil and grease, benzo(a)anthracene, benzo(k)fluoranthene, and benzo(a)pyrene. The detections varied from less than two times up to six times the cleanup standards for these four contaminants. This sample was in the Site 14 ditch, that drains asphalt-covered areas, and could be expected to receive PAHs from surface water runoff. The excavation was not pursued further in the drainage ditch.

**Sandra Lunceford comment #2:** Have all cleanup standards for sediment at Site 69 been met, and if not what is the plan?

**Response:** Additional excavation is still required to remove sediment at Site 69 in which contamination exceeds cleanup standards.

**Sandra Lunceford comment #3:** The name for Site 80, as I understand, is Golf Course Area Maintenance Ditch. Table 1 states differently.

**Response:** The table has been revised to provide site descriptions rather than sites names.

**Sandra Lunceford comment #4:** A recurring comment of mine is the concern over potential exchange of polyaromatic hydrocarbons (PAHs) for catechols, epoxides, quinones, and acid byproducts. Bioremediation is known for breaking down PAHs into harmless byproducts of CO<sub>2</sub> and H<sub>2</sub>O, but there are cases when this ideal situation may not occur. A study performed in 1986 by Melissa Rochkind, James Blackburn, and Gary S. Sayler (EPA/600-2-86-090) shows the breakdown of chlorinated aromatic compounds may result in the above hazardous byproducts, and Casarett and Doull in 1991 (p. 98 and 688) document that diol-epoxide formation stands at the basis of bay region carcinogenesis.

The response to my last comment about this issue was basically a question about how long the intermediate products remain in the ground. I believe I have noticed epoxides turning up in some sampling results and would like to follow-up on my request for regular sampling for these products in bioremediated areas with PAHs to ensure that the systems continue to be protective of public health and the environment.

**Response:** Comment Noted. There are very limited volumes of soil with PAHs being bioremediated at Mather, and these are generally at low concentrations, and generally not

chlorinated. Soils treated at the bioremediation cell have been disposed of in either Site 4 or Site 7, where human exposure is prevented by site security and landfill caps. Soil treated in situ contains primarily TPH in the gasoline or diesel ranges at depths below excavation limits. The only epoxide that is reported using the standard SW-846 analytical methods is heptachlor epoxide, which is reported using method 8080 (pesticides) and 8270 (semivolatile organics). The concentrations of any PAHs being bioremediated at depth by bioventing at any of Mather's sites are far less than the concentrations in asphalt present and exposed to air in roadways and parking lots. Therefore, the risk of exposure to any bioremediation byproducts from Mather's IRP sites is considered extremely low, and sampling for catechols, epoxides, quinones, and other byproducts is not judged necessary.

**Sandra Lunceford comment #5:** I am wondering whether another objective, other than cost, can be added to determining SVE shut-off criteria. Is it possible to consider how residual product will effect groundwater contaminant mass and whether the remaining systems will continue to be as protective of human health and the environment. As it stands, cost appears to be the only concern.

**Response:** Remedial decisions rely on cost-benefit analysis. Where regulatory standards exist, CERCLA requires that these cleanup standards be met unless the costs are so extreme that the benefits of cleanup are exceeded by the costs. The SVE shutoff criteria consider many factors, but ultimately the decision of whether to shut off an SVE system can be described as a cost-benefit analysis. The benefits can include considerations such as the effects of residual contamination on underlying groundwater.

**Sandra Lunceford comment #6:** What is the current proposed sampling frequency for NE Plume monitoring? Monitoring schedules after cleanup standards are attained are contained in bullet #2, but what is the current frequency? When will modeling be complete for the NE Plume? Paragraph 3 on page 3-14 states that nine wells have had at least one sample of contaminant exceeding cleanup standards, and Paragraph 4 refers to eight wells with detections above cleanup standards.

**Response:** The sampling frequency for the Northeast Plume monitoring is governed by the annual Groundwater Monitoring Program Evaluation Report. The text has been revised to describe the predictive modeling that will be conducted for the Northeast Plume to satisfy the ROD requirement. The text has been revised to correct the discrepancy; there are 8 wells that have had detections above one or more of the cleanup standards for the Northeast Plume since issuance of the ROD.

**Sandra Lunceford comment #7:**

**Response:** Are there any plans to replace lost groundwater monitoring wells. How many can be removed and not affect data accuracy, especially regarding calculating percent of land affected by contamination in the NE Plume?



**Response:** There are no plans to replace wells monitoring the Northeast Plume that have become dry to date. However, loss of additional wells or migration of contaminants may warrant the installation of additional wells in the future. The calculation of the percent of land affected by contamination in the Northeast Plume is not a calculation that demands great accuracy; the estimate is presented in the report as an indication that a large amount of the plume meets cleanup standards.

**Sandra Lunceford comment #8:** There are some missing words on p. 2-22 under 2.6.4.

**Response:** The text has been revised to correct this error.

## **Appendix B:**

### **Response to Comments on Draft Final Mather Five-Year Review**

Comments from the Department of Toxic Substances Control on the Draft Final Five-Year Review:

**DTSC comment #1:** The Department of Toxic Substances Control (DTSC) has received the subject document dated June 29, 1999. As per the Federal Facility Agreement, this five-year review looks at the Aircraft Control and Warning (AC&W) Operable Unit (OU) Record of Decision (ROD) remedial actions, but also all other remedial actions selected for all additional OUs.

DTSC has reviewed the subject document and finds that the format and information is fairly complete and comprehensive. However, as stated in our letter to you dated November 18, 1997, DTSC is again requesting that language on institutional controls be included in the appropriate RODs.

DTSC's position is that institutional controls are remedies which must be implemented to protect human health and/or the environment from the effects of hazardous substances left in place or to the physical remedy. The Air Force has the option of either cleaning up sites to contaminant concentrations which allow unrestricted use, or leaving contamination in place at concentrations which do not allow unrestricted land use. If contamination is left in place, then land use restrictions must be implemented. When institutional controls are chosen as the remedy or part of the remedy the institutional controls should be documented in a ROD.

**Response:** The Air Force does not necessarily agree with the assertion that if contamination is left in place, then land use restrictions must be implemented. If contamination left in place does not allow unrestricted use, then institutional controls are generally warranted. However, land use restrictions are just one of the types of institutional controls. EPA's "Land Use in the CERCLA Remedy Selection Process" guidance (OSWER Directive 9355.7-04, May 25, 1995), states that "institutional controls will generally have to be included ... to prevent an unanticipated change in land use that could result in unacceptable exposures to residual contamination, or, at a minimum, alert future users to the residual risks and monitor for any changes in use." (emphasis added) "Institutional controls" are "non-engineering methods intended to affect human activities in such a way as to prevent or reduce exposure to hazardous substances (e.g., deed restrictions such as easements and covenants, deed notices, land use restrictions such as zoning and local permitting, ground-water use restrictions, and public health advisories)." See EPA's "A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents," (OSWER Directive 9200.1-23P, July 1999, page 6-26, f.n. 16).

The Five-Year Review states the position of the Air Force that the RODs for the first five operable units contain adequate institutional controls, as described in the National Contingency Plan (NCP), which support or complement the remedial actions to protect public health and the environment. The only sites at Mather which where contamination or solid waste may remain at concentrations which do not allow unrestricted land use are landfill sites 3, 4, and 7, Site 87, and possibly Site 89.

With regard to Site 89, it is currently being evaluated in the Supplemental Basewide OU Focused Feasibility Study (FFS). Therefore, the selected remedy for Site 89 has not been documented in a ROD. If the FFS indicates the selected remedy should include institutional controls, or if State or Federal requirements that include the need for institutional controls are demonstrated to qualify as ARARs for Site 89, then the Air Force will document institutional controls in the ROD.

For the remaining sites where contamination may be left in place that does not allow unrestricted land use, the Air Force has provided substantial documentation of institutional controls in its CERCLA RODs when institutional controls are chosen as the remedy or part of the remedy.

With regard to Site 87, the Basewide OU ROD already documents necessary institutional controls as part of the selected remedy for that site. See Section 2.2.9.6 of the Basewide OU ROD which states that institutional controls are warranted, with the goal of limiting unacceptable exposure where contamination (lead) remains in place after cleanup such that the site is not compatible with residential (or unrestricted) use. The ROD further states that institutional controls could consist of lease restrictions and/or deed restrictions and that these institutional controls will prohibit land use that presents unacceptable risk to human health due to residual contamination. Additionally, the ROD documents the Air Force's legal commitment to comply with extensive DTSC and Water Board regulatory requirements as ARARs for Site 87, to include requirements for management of waste piles. These regulations include extensive closure and postclosure care requirements, some of which would constitute institutional or site controls.

With regard to sites LF 3 and LF 4, the Landfill OU Sites ROD states that the selected remedy for both sites will contain access restrictions and an engineered cap to prevent contact with the contaminants. See Sections 2.9.3 and 2.9.4. These remedy selections incorporate the earlier discussion of the selected remedial alternatives discussed in Sections 2.7.3.2 and 2.7.4.2. In Section 2.7.3.2, the ROD explains that this alternative will include access restrictions that would involve fencing and deed restrictions to preserve the integrity of the engineered cap, to prevent excavations and certain types of land use (such as fanning) that are deemed inappropriate. Section 2.7.4.2 includes similar language. In addition, the ROD commits to compliance with most portions of 40 CFR Part 258, which include the requirement for the Air Force to add a notification to the deed following closure of the landfills to alert prospective owners that the property was used as a landfill. 40 CFR Part 258 also includes extensive requirements for post-closure

care, that include monitoring requirements. The ROD also committed the Air Force to comply with the State Integrated Waste Management Board's comprehensive regulatory requirements for waste disposal sites for LFs 3 and 4. These requirements include emergency response plans, site and access security, site closure plan requirements to show that proposed uses of the closed sites or development of such sites are compatible with open space, post closure care requirements, prohibitions against scavenging, and various other types of controls pertaining to the site. The ROD also committed the Air Force to various Water Board requirements, including the requirement to erect permanent surveyed monuments that indicate the location, elevation of wastes, contaminant structures, and monitoring facilities so that they can be determined throughout the postclosure maintenance period.

With regard to LF 7 (the 7100 area), the Soil OU Sites and Groundwater OU Sites ROD, and the Explanation of Significant from the Record of Decision for Disposal of Contaminated Soil at Site 7/11, commit the Air Force to comply with various State Integrated Waste Management Board and Water Board regulatory requirements, many of which are either institutional control or site controls, pertaining to waste disposal sites, as described above.

**DTSC comment #2:** In California, institutional controls or restrictions are implemented through a land use covenant signed by DTSC and the current landowner, pursuant to Section 1471 of the California Civil Code. DTSC's strong preference is to enter into a land use covenant(s) with the Air Force.

**Response:** Comment noted. The Air Force is implementing its land use controls (LUCs) and NCP institutional controls (ICs) in accordance with its Management Strategy for the Implementation, Monitoring and Enforcement of Land Use Controls and Institutional Controls, which will be available in October 1999.

**DTSC comment #3:** DTSC concurs with the decision made by the Air Force that it is appropriate to address institutional controls in either a ROD Amendment or in the Supplemental Basewide OU ROD. Section 6.1 of the Five Year Review should be revised to explain how the Air Force plans to implement this decision and to include a schedule for completion.

**Response:** Section 6.1 has been revised to provide a schedule for preparing either a ROD Amendment or Explanation of Significant Differences (ESD) for the AC&W Operable Unit. The Air Force has not decided at this time whether to amend the ROD or whether to prepare an ESD. This schedule will be formally proposed in a separate letter in accordance with the Federal Facility Agreement for Mather AFB

## **Comments from the Central Valley Regional Water Quality Control Board on the Draft Final Five-Year Review:**

**RWQCB general comment A:** We have reviewed the *Draft Final Five-Year Review of Remedial Actions Under CERCLA* (Draft Final Review), submitted 1 July 1999. This letter has been coordinated with the Department of Toxic Substances Control. Appendix A includes the Response to Comments submitted by the regulatory agencies. We continue to have concerns with the comment responses and recommendations presented in the Draft Final Review with respect to institutional controls, addressing new potential contaminants of concern, and modeling of the northeast plume. In the meantime, we do not concur with the responses to our comments without additional clarifications or revisions.

**Response:** The comments have been discussed with the RWQCB remedial project manager. Clarifications and/or revisions have been made in response to these comments.

**RWQCB general comment B:** The Air Force has proposed a schedule for revision and finalization of the Draft Final Review. The proposed schedule was documented in *the Consensus Statement for Revision of Five-Year Review Report, 8/11/99*, and approved by the RPMs. The revised Draft Final Review is scheduled to be issued on 15 September 1999. The revised Draft Final Review will become final on 22 September 1999. We are available to discuss and resolve the outstanding issues with the RPMs at the earliest opportunity. Our comments and suggestions for resolution of the issues are presented below.

**Response:** Comment noted.

**RWQCB specific comment #1a: Institutional Controls:** Our comments on the Draft Five-Year Review (letter dated 7 May 1999, Major Comment 1) addressed the lack of institutional controls in Mather's Record of Decisions (RODs). The Air Force response commits to amending the Aircraft Control and Warning (AC&W) Operable Unit (OU) ROD, either in a ROD Amendment or in the ROD for the Supplemental Basewide OU. The Air Force has previously stated a preference for preparing ROD Amendments for individual RODs. We concur with the decision to amend the AC&W ROD to address institutional controls in either a ROD Amendment, or in the Supplemental Basewide OU ROD. The Draft Final Review should be revised to explain how the AC&W ROD will be amended and include a time schedule for completion.

**Response:** Please see the Air Force's response to DTSC Comment No. 1 regarding the issue of whether Mather RODs lack sufficient discussion of institutional controls.

Section 6.1 has been revised to provide a schedule for preparing either a ROD Amendment or Explanation of Significant Differences (ESD) for the AC&W Operable Unit. The Air Force has not decided at this time whether to amend the ROD or

whether to prepare an ESD. This schedule will be formally proposed in a separate letter in accordance with the Federal Facility Agreement for Mather AFB.

**RWQCB specific comment #1b:** The Air Force response to comments also proposes preparation of a “strategy/implementation plan” that would include the details of a “layering strategy” to identify how the combination of engineering controls and administrative controls combine to provide protection of human health and the environment, as well as protection for the remedial systems. The Air Force response also, distinguishes between institutional controls that are implemented to protect human health and the environment and those that are relied upon to protect the remedial actions. We believe protection of remedial actions is necessary to protect human health and the environment, therefore, we do not agree with the Air Force interpretation that distinguishes the protective nature of institutional controls.

**Response:** The Air Force will implement institutional controls using a base-specific layering strategy which is described in AFBCA’s Management Strategy for the Implementation, Monitoring and Enforcement of Land Use Controls and Institutional Controls. This strategy document will be available in October 1999. One of the tools for implementation of ICs used by AFBCA at Mather has been to include use restrictions in leases and restrictive covenants in deeds. “Institutional controls” are “non-engineering methods intended to affect human activities in such a way as to prevent or reduce exposure to hazardous substances (e.g., deed restrictions such as easements and covenants, deed notices, land use restrictions such as zoning and local permitting, ground-water use restrictions, and public health advisories).” See EPA’s “A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents,” (OSWER Directive 9200.1-23P, July 1999, page 6-26, f.n. 16). (emphasis added) In addition, the Air Force has erected site controls such as fences around treatment units to reduce the likelihood that the systems will be disrupted. However, the Air Force does not consider these site controls a necessary part of the remedial action relied upon to preclude exposure to health threatening concentrations of contaminants. See EPA’s “A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents,” (OSWER Directive 9200.1-23P, July 1999), sections 6.39 and 6.3.12. The details of measures used by the Air Force to minimize disruption to the remedial systems are usually provided in O&M plans, long-term monitoring plans or property transfer documents prepared in consultation with the State of California and the U.S. EPA. However; the Air Force’s legal commitment to certain remedy protective measures for landfill or other types of waste disposal sites is documented in the Mather RODs as compliance with specific State or EPA regulatory requirements as ARARs for site controls or other forms of remedy protection requirements.

**RWQCB specific comment #1c:** Institutional controls must be addressed in an enforceable document (i.e., a ROD or ROD Amendment) and include: the objective of the institutional controls and how they are implemented (i.e., legal instruments); which parties are involved; a timeline for implementation; and specify documents that will

address the details of implementation. A strategy/implementation plan may be an appropriate document to include the details of implementing the institutional controls (i.e., process for implementation). The strategy/implementation plan should be a primary document subject to the terms of the Federal Facilities Agreement. Another option would be to incorporate a strategy/implementation plan into the BRAC Cleanup Plan. We are available to discuss and resolve these issues prior to the revision of the Draft Final Review. Section 6.1 of the Draft Final Review should be revised to incorporate the decisions made to address these concerns and include a time schedule for addressing institutional controls in ROD Amendments or the Supplemental Basewide OU ROD.

**Response:** Those institutional controls that are a part of the selected remedy (i.e. Site 87) or that are ARARs (i.e. sites 3, 4, and 7) are incorporated into decision documents. However, the level of detail requested is not found in the RODs. The response to the previous comment explains the current efforts to develop implementation plan for institutional controls at Mather.

**RWQCB specific comment #2: Additional Contaminants of Concern (COCs):** Our comments on the Draft Five-Year Review (Major Comment 2) addressed identification and cleanup of additional COCs that are detected during soil vapor extraction (SVE), and are not identified as COCs in a ROD. The Air Force response states that all in situ treatment systems at all sites with additional COCs are currently being operated in vapor extraction mode. In addition, Section 6.2 has been revised to state that the significance of the additional COCs will be evaluated prior to terminating the SVE system operation, including their persistence, extent, and presence in nearby groundwater. The narrative standards in the ROD will be applied to any additional contaminants that threaten groundwater quality.

At the 10 August 1999 RPM meeting, the Air Force agreed to a joint effort in conducting an evaluation of additional COCs, in response to our concerns with postponing an evaluation until just prior to proposed SVE system termination. We concur with this proposal and suggest that a matrix be prepared to evaluate each additional COC identified. Should additional COCs be identified that are not compatible with the selected remedy of SVE, then an Explanation of Significant Difference (ESD) or ROD Amendment may be necessary to address the additional COCs. Section 6.2 of the Draft Final Review must be revised to incorporate the decisions made to address these concerns and a schedule for preparation of an additional COC evaluation. Section 6.2 should also be revised to address contingencies if additional COCs are identified that are not compatible with the selected remedy of SVE.

**Response:** AFBCA concurs with this comment. Section 6.2 has been revised to reflect the agreement reached at the 10 August 1999 BCT meeting. Section 6.2 also states that if additional COCs are identified that are not compatible with the selected remedy of SVE, the BCT will address whether to interrupt the remedial action and whether an

Explanation of Significant Differences or ROD amendment is needed to adjust the remedy to be compatible with the additional COC(s).

**RWQCB specific comment #3: Northeast Groundwater Plume Modeling:** Our comments on Section 3.2.4.2 (Specific Comment 5) addressed the Groundwater OU ROD requirement for the Air Force to perform groundwater modeling for the Northeast groundwater plume prior to the first five-year review. The purpose of this modeling is to predict how much time will be required for the contaminant concentrations to fall below the cleanup standards. This modeling has not been performed. Furthermore, we requested in our Draft Review comments, that the modeling efforts include an evaluation of potential impacts to the existing Mather water supply wells, which are down gradient of the Northeast plume. We believe that modeling should include scenarios that assume that all four Mather supply wells are pumping at capacity to determine if operation of these wells will adversely affect the Northeast plume or the Main Base/SAC groundwater plume treatment system.

The Air Force response states that a predictive evaluation will be conducted for the Northeast plume in 1999 to satisfy the ROD requirement. We believe that a predictive evaluation is an acceptable first step, but does not fully comply with the ROD requirements. Current negotiations with Sacramento County regarding the future status of the Mather supply wells are ongoing. Issues related to perchlorate contamination originating from a source other than Mather are currently being investigated. Therefore, we believe that the value of predictive modeling can be better determined when more information is available and negotiations with Sacramento County are further along.

We suggest that the following language be included in the last paragraph of Section 3.2.4.2:

*As a first step toward satisfying the ROD, an evaluation of the northeast plume will be published by the Air Force in 1999. The evaluation will review the adequacy of current monitoring network, include trend analysis, support the decision to continue monitoring the Northeast plume as opposed to initiating active remediation, and recommend a similar evaluation be conducted periodically as monitoring data warrants. The requirement to perform predictive modeling will be reevaluated in each Annual Basewide Groundwater Monitoring Report.*

**Response:** The Air Force has committed to preparing a predictive evaluation of the Northeast Plume to satisfy the ROD commitment. The Air Force concurs that periodic assessment is appropriate, rather than the single modeling effort the ROD requires. The initial evaluation will summarize both the contaminant monitoring in the Northeast Plume monitoring wells, and the historic potentiometric data which showed no measurable deflection attributed to operation of the Main Base supply wells during the period of observations. The language proposed in the comment has been modified and is incorporated as follows:



*To satisfy the ROD requirement for predictive modeling of the Northeast Plume, an evaluation will be published by the Air Force in 1999. The evaluation will review the adequacy of current monitoring network, include trend analysis, support the decision to continue monitoring the Northeast plume as opposed to initiating active remediation, and recommend a similar evaluation be conducted periodically as monitoring data warrants, but no less frequently than the five year reviews. Predictive modeling at this time cannot confidently forecast whether the contaminant concentrations will meet the cleanup level within a reasonable time. Therefore, additional predictive modeling will be conducted periodically until cleanup standards are satisfied. Changes and trends in the Northeast Plume monitoring results will be evaluated in each Annual Basewide Groundwater Monitoring Report, and the Remedial Project Managers may propose predictive modeling at any time.*